Case Report

Stable course of a giant cerebral arteriovenous malformation during pregnancy: A case report

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ABSTRACT

Cerebral arteriovenous malformations (AVMs) are rare vascular anomalies that pose significant challenges during pregnancy due to the risk of intracranial hemorrhage and lack of clear management guidelines. Management depends on individualized decision-making and a multidisciplinary approach. We report the case of a 32-year-old G3P1L1A1 with a long-standing cerebral AVM in the right parieto-temporo-occipital lobe with midline shift diagnosed in 2011, who presented during pregnancy with headache at 29 weeks of gestation but without neurological deficits. Magnetic resonance imaging revealed an AVM of 9.4 × 6.6 × 4.2 cm with multiple arterial feeders and deep venous drainage via the vein of Galen and midline shift. She was managed conservatively with multidisciplinary monitoring throughout pregnancy. She underwent elective cesarean section at 37 weeks of gestation, delivering a healthy baby. The patient remained stable in the postpartum period without requiring neurosurgical intervention. This case highlights that even high-grade AVMs with mass effect may remain stable during pregnancy, supporting individualized and conservative management in selected patients.

Key words: Arteriovenous malformations, Cerebral, Malformations, Vascular lesions

Cerebral arteriovenous malformations (AVMs) are rare congenital vascular lesions characterized by abnormal direct connections between arteries and veins without an intervening capillary bed. The estimated prevalence is approximately 0.01% in the general population, and symptoms appear between the ages of 20 and 40 years, with 30 years being the most prevalent age [1,2]. Pregnancy is associated with physiological hemodynamic changes including increased blood volume and cardiac output, which may increase the risk of AVM rupture in pregnancy more than in non-pregnant periods, particularly in the second and third trimesters [3]. However, recent evidence remains conflicting, particularly in patients without prior hemorrhage. This uncertainty is particularly relevant in women with large, deeply draining, high-grade AVMs, in whom management must balance maternal neurosurgical safety, fetal maturity, and the risk of neurosurgical or endovascular intervention. Management of AVM in pregnancy is complex and depends on lesion characteristics, prior hemorrhage, neurological status, and gestational endovascular therapy, surgical resection, or stereotactic radiosurgery, although invasive interventions during pregnancy are usually reserved for life-threatening situations [1].

We present a case of a pregnant woman with a long-standing giant Spetzler-Martin grade V cerebral AVM with deep venous drainage and secondary venous outflow and midline shift who was managed conservatively and had a favorable maternal and fetal outcome, highlighting the importance of individualized multidisciplinary management. Given the limited literature describing the clinical course of giant, high-grade cerebral AVMs managed conservatively during pregnancy, we report this case to contribute to the existing evidence and to emphasize that carefully selected patients may achieve favorable maternal and fetal outcomes despite high-risk angioarchitectural features.

CASE PRESENTATION

A 32-year-old woman, G3P1L1A1, a known case of cerebral AVM involving the right parieto-temporo-occipital lobe diagnosed in 2011. She has been managed conservatively since diagnosis and was on antiepileptic

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therapy with no history of prior intracranial hemorrhage, neurosurgical intervention, or focal neurological deficit. She conceived spontaneously and had an uneventful early pregnancy. At 25 weeks 1 day of gestation with amenorrhea, she was first admitted with headache. The headache was diffuse, moderate in intensity, and not associated with vomiting, visual disturbances, limb weakness, speech difficulty, or seizures. There was no history of loss of consciousness or trauma.

On examination, she was conscious, oriented, and hemodynamically stable, and the Glasgow Coma Scale was 15/15 at presentation. Neurological examination revealed bilaterally equal and reactive pupils with no focal neurological deficits. Her symptoms improved with conservative management, and she was discharged. She was readmitted at 29 weeks 5 days gestation with recurrent headache. Repeat neurological examination remained unchanged. She was followed up in the antenatal Outpatient Department. by a multidisciplinary team as she was reluctant for admission and remained neurologically stable throughout the term pregnancy.

Hemoglobin was 12 g/L and other basic laboratory investigations were within normal limits. Obstetric examination showed a uterus corresponding to gestational age with reassuring fetal heart rate, and growth scan with Doppler studies were normal, with placenta at fundoanterior body. Fetal echocardiography was normal. Serial Magnetic resonance imaging (MRI) was done over the years, and MRI brain showed a serpiginous tuft of vessels with T2 hypointense flow voids noted in the right temporo-parieto-occipital lobe. The nidus measures 9.4 × 6.6 × 4.2cm (APxTRxCC), and is mainly supplied by a branch of the right posterior cerebral artery and a few branches from the middle cerebral artery, and drained by the vein of Galen to the superior sagittal sinus through the falcine vein (Fig. 1). The lesion involves the visual cortex and is seen causing mass effect in the form of contralateral midline shift ~ 6 mm and effacement of the occipital horn and body of ipsilateral lateral ventricle. No obvious intranidal aneurysm could be appreciated. In view of her known AVM and current symptoms, a multidisciplinary team comprising obstetricians, neurologists, neurosurgeons and anesthesiologists was involved.

As there were no signs of intracranial hemorrhage or a new neurological lesion was identified, and the patient remained clinically stable without signs of raised intracranial pressure or neurological deterioration, conservative management was done, and close clinical surveillance was continued. The remainder of the antenatal period was uneventful. Serial antenatal visits showed normal fetal growth and well-being. No new neurological symptoms were noted. Considering the presence of cerebral AVM with deep venous drainage and midline shift and the potential risk of raised intracranial pressure during labor, an elective cesarean section was planned at 37 weeks of gestation. Under regional anesthesia with careful hemodynamic monitoring, she underwent lower segment cesarean section with bilateral tubectomy and delivered a healthy term neonate with good Apgar scores.

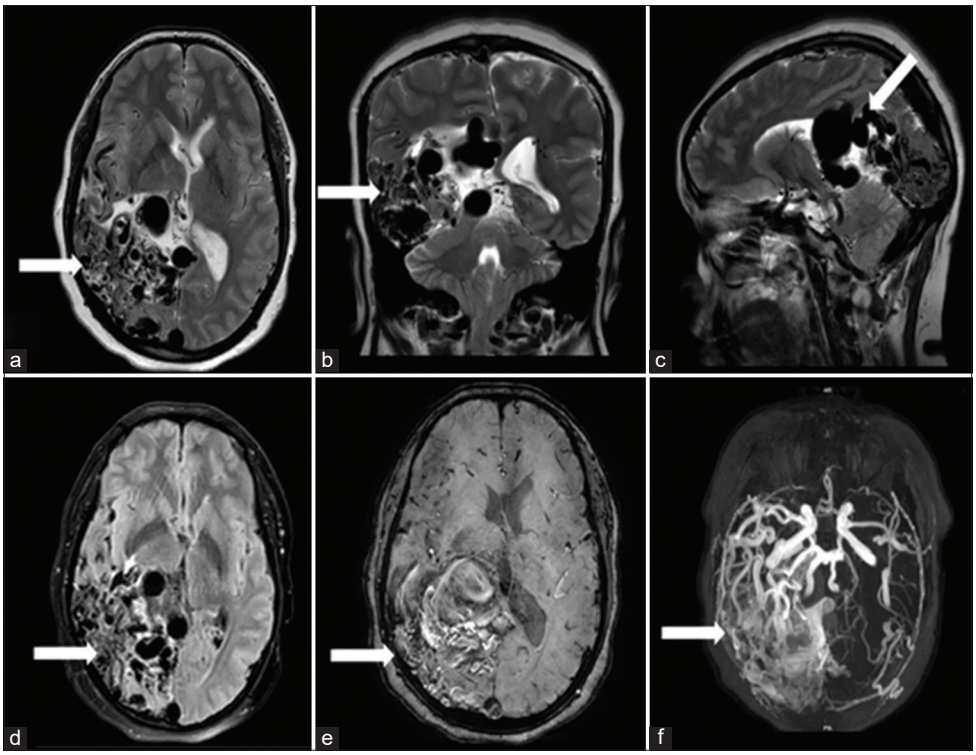

Figure 1: Magnetic resonance imaging brain of a pregnant patient in the early third trimester, showing an arteriovenous malformation (AVM) in the right temporo-parieto-occipital lobe (solid arrows) seen as multiple serpiginous flow voids on (a-c) images. (a) T2WI image in axial showing evidence of midline shift toward the left side with effacement of ipsilateral lateral ventricle (b) T2WI in coronal showing effaced lateral ventricle. (c) T2WI in sagittal showing dilated draining vein of Galen (arrow). (d) T2 FLAIR images in axial showing hyperintense foci suggestive of gliosis. (e) Susceptibility weighted image showing a few patchy hypointense susceptibility foci of bleed (arrow). (f) Time-of-flight angiography images showing the abnormal tuft of AVM (arrow)

The intraoperative and post-operative periods were uneventful. There were no neurological complications. She was discharged in stable condition with advice for regular follow-up with neurology and neurosurgery services. No invasive intervention for the AVM was undertaken during pregnancy or the immediate postpartum period.

The patient did not attend scheduled outpatient follow-up visits after discharge. However, during a subsequent telephone follow-up, she reported that she was doing well and had no complaints, including headaches, seizures, focal neurological deficits, visual disturbances, or any hospital admissions since discharge. She was residing in her native village, and no repeat neuroimaging was available.

DISCUSSION

Cerebral AVM is rare, and pregnancy increases the incidence of cerebral AVM due to hormonal changes and increased hemodynamic stress. The decision-making in management is influenced by a number of factors: AVM location, bleeding history, aneurysm association, gestational age, symptom severity, AVM rupture index, Spetzler-Martin or Lawton-Young grading system, and emergent conditions [4].

The management of cerebral AVM during pregnancy remains controversial due to conflicting rupture risk. The primary concern is the risk of intracranial hemorrhage, which carries high maternal and fetal morbidity and mortality. Some studies suggest that pregnancy does not significantly increase the risk of AVM rupture, and Agarwal *et al*., report a range between 0.6% and 3.5%, which is similar to the annual hemorrhage risk reported in the general population with AVM [2,5]. Whereas, in a systematic review of nine studies involving 2426 women, De Maria *et al*., reported an overall hemorrhage rate of 2.6% among untreated women and a higher risk of first hemorrhage during pregnancy compared with the non-pregnant fertile period, particularly during the second and third trimester. They recommend individualized multidisciplinary management when definitive treatment was deferred [6]. Kow *et al.,* reported a right parietal occipital AVM presenting with sudden severe headache, visual loss, and subarachnoid hemorrhage, followed by cesarean delivery at 34+5 weeks and subsequent Gamma Knife treatment [1]. Chen *et al*., reported a 21-year-old pregnant woman with a giant AVM and an intracranial aneurysm who presented with subarachnoid hemorrhage and an intracranial hematoma. The associated aneurysm was clipped, followed by microsurgical excision of the AVM [7]. Sohail *et al*., reported a pregnant woman who presented at 15 weeks of gestation with intracranial hemorrhage secondary to a ruptured cerebral AVM associated with a giant venous aneurysm and subsequently required endovascular intervention due to clinical deterioration [8].

Our case is notable for the absence of hemorrhage despite the presence of a large 9 cm nidus involving the right temporo-parieto-occipital region with multiple high-risk angioarchitecture features, including deep venous drainage through the vein of Galen with further drainage into the superficial sagittal sinus through the falcine vein, and was classified as Spetzler-Martin grade V. The patient remained clinically stable throughout pregnancy without rupture. The long-standing nature of the lesion, with absence of prior hemorrhage, which is the most significant and consistently identified predictor of AVM rupture, and a large malformation and a high Spetzler-Martin grading system grade are generally associated with reduced risk of adverse outcome [9].

Furthermore, larger AVMs may have relatively lower intranidal pressure due to better developed venous drainage, reducing the likelihood of rupture. Smaller AVM nidus is more likely to be associated with hemodynamic factors that increase the risk of high-risk hemorrhage and rupture [10]. In addition, the patient did not exhibit acute precipitating factors such as severe hypertension, seizures, or neurological deterioration, which are commonly implicated in triggering AVM rupture.

Invasive interventions are usually deferred until the postpartum period unless there is life-threatening hemorrhage or rapid neurological deterioration. It has been reported that early surgical resection does not have a better outcome than conservative management [6].

The optimal mode of delivery in women with cerebral AVM is also debated. Vaginal delivery is not absolutely contraindicated, especially in stable, unruptured AVMs. However, cesarean section is often chosen to avoid the hemodynamic surges and Valsalva maneuvers associated with labor, particularly in patients with large lesions, mass effect, or previous neurological symptoms, even though AVM rupture during childbirth does not appear to increase [11,12].

This case highlights that not all high-grade AVMs behave aggressively during pregnancy and emphasizes the importance of individualized risk assessment rather than reliance on anatomical risk factors alone.

CONCLUSION

This case demonstrates that even giant, high-grade cerebral AVMs with deep venous drainage remain stable during pregnancy in the absence of prior hemorrhage. It underscores the importance of individualized multidisciplinary management and suggests that conservative management can be considered in carefully selected patients despite the presence of high-risk features.

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