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Case Report

Management of Obstructive Hydrocephalus in Pregnant Patient

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Abstract

De novo obstructive hydrocephalus is a rare event during pregnancy. There are only case reports presented in literature. We aimed to discuss the pathophysiological basis and management options with an exemplary case presentation and review of the current literature. A 28-year-old G2P1 patient presented to our clinic with headache, vomiting, and deteriorated vision at the 8th week of gestation. She had no history of central nervous system infection or trauma. A brain magnetic resonance imaging was obtained. There was hydrocephalus due to cerebral aqueduct stenosis (Evan's index of 58%). She was managed conservatively with bed rest and diuretics; however, she got no relief. A ventriculoperitoneal shunt was inserted at the 13th week of gestation. At the 38th week, she had cesarean section (C/S) due to previous history of C/S in the first pregnancy and present cord entanglement of the fetus. C/S was conducted under epidural anesthesia after conforming she had no increased intra cranial pressure findings. Delivery was uneventful with a healthy newborn. Obstructive hydrocephalus is a very rare complication during pregnancy. Hydrocephalus becomes obvious and necessitates treatment, before the third trimester of pregnancy. Timely diagnosis, especially differentiation from preeclampsia, is a life-saving step. If no complication happens during intervention for hydrocephalus, spontaneous vaginal delivery is a safe way of delivery for both mother's and newborn's well-being. C/S should be saved for obstetrical indications and can be conducted under epidural anesthesia if intracranial pressure is kept under control. Interdisciplinary approach of neurosurgeons and anesthesiologists is pivotal for delicate care of the patient and the baby.

Keywords: *Delivery, hydrocephalus, pregnancy, ventriculoperitoneal shunt*

Introduction

Hydrocephalus is a neurosurgical disorder with major constraints both in pediatric and adult population.[1] Prevalence of hydrocephalus is 0.9–1.2/1.000.[2] There are two subtypes as communicating and noncommunicating (obstructive) hydrocephalus. *De novo* obstructive hydrocephalus developing during pregnancy is a rarely reported event. There are only case reports presented in literature [Table 1].[3-14] We aimed to discuss the pathophysiological basis and management options for obstructive hydrocephalus diagnosed during pregnancy with an illustrative case presentation and review of the current literature.

Case Report

A 28-year-old G2P1 patient presented to our clinic with headache, vomiting, and deteriorated vision at the 8th week of gestation. At her admission, fundoscopic examination revealed papilledema and optic atrophy. She had no history of central nervous system infection or trauma. A brain magnetic resonance (MR) imaging was obtained. There was hydrocephalus due to cerebral aqueduct stenosis (Evan's index of 58%) [Figure 1]. She was managed conservatively with bed rest and diuretics; however, she got no relief. A ventriculoperitoneal (VP) shunt was inserted at the 13th week of gestation. Third generation cephalosporin was given to patient I.V. during shunt procedure. The surgery was uneventful, and she recovered completely in a stepwise manner after the surgery. Her fundoscopic findings regressed in follow-ups. At the 38th week, she had a cesarean section (C/S) due to the previous history of C/S in the first pregnancy and present cord entanglement of the fetus. C/S was conducted under epidural anesthesia after conforming she had no increased intracranial pressure (ICP) findings. Delivery was uneventful with a healthy newborn. Ampicillin and gentamicin were given for 48 h after the delivery.

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Table 1: Literature review of patients with hydrocephalus developed during their pregnancies

Authors/year	Age (years)	Presentation	Mode of treatment	Time of treatment*	Delivery method	Complications	Notes
Monfared *et al.* (1979)	25	Headache, nausea, vomiting	VA	27	SVD	None	-
Howard and Herrick (1981)	25	N/A	VP	12	SVD	None	Ampicillin/ gentamicin given at time of labor and delivery
Nugent and Hoshek (1986)	30	Headache, nausea, depressed sensorium	VP	7	SVD	Shunt displacement (extra-abdominal)	Extra-abdominal cyst formation 3 weeks postpartum
Wisoff *et al.* (1991)	N/A	N/A	VPL	In last 2 trimester**	C/S	None	She was operated for posterior fossa mass lesion after delivery
Naidoo and Bhigjee (1998)	26	Headache, vomiting, neck pain, diplopia, inability to walk	VP (with resection of posterior fossa hemangioblastoma)	7	C/S	Symptoms worsened 3 months later with increase in tumor size	She recovered after delivery and tumor size decreased with stable follow-up
Suarez and Iannucci (1999)	21	Headache, vomiting, deterioration of consciousness	Ventriculostomy (switched to VP after delivery)	33.5	SVD	VP shunt dysfunction 4 months later	Neurocysticercosis diagnosed and treated with albendazole and prednisone. VP shunt was revised due to its obstruction
Beni-Adani *et al.* (2001)	24	Headache, papilledema, ataxia, multiple cranial nerve weakness	VP	35	C/S	None	She was operated for vestibular schwannoma after delivery
Bharti *et al.* (2002)	27	Headache, nausea, vertigo, hearing impairment, blurred vision	VP	30	C/S	Symptoms resolved after surgery, yet worsened 2 weeks later and delivery of baby done with recovery of symptoms	Radiation therapy was planned for posterior fossa meningioma
Chopra *et al.* (2004)	25	Headache, nausea, vomiting, blurred vision	VP	25	N/A	VP shunt dysfunction 4 months later	Stereotactic biopsy of bilateral thalamic lesion revealed to be Grade II astrocytoma. VP shunt revision due to knot formation in the peritoneal part of VP shunt
Watanabe *et al.* (2005)	39	Headache, nausea, deterioration of consciousness	E3V (after ventricular drainage)	19***	C/S	None	-
Riffaud *et al.* (2006)	36	Headache, memory disturbance	E3V	28	C/S (spinal anesthesia)	None	She was operated for temporal lobe cavernoma and tectal plate glioma (Grade I) after delivery
	22	Headache, vomiting, seizure	E3V	8	C/S (general anesthesia)	None	She was followed-up for tectal plate lesion

Contd...

Table 1: Contd...

Authors/year	Age (years)	Presentation	Mode of treatment	Time of treatment*	Delivery method	Complications	Notes
Shah and Chamoun (2014)	20	Headache, nausea, vomiting, gait imbalance, left facial weakness, left ear hearing loss	VP	26	C/S	Worsening respiratory status, dysphagia (due to mass lesion)	She was operated for vestibular schwannoma after delivery
Presented case	28	Headache, vomiting, vision disturbance	VP	13	C/S (epidural anesthesia)	None	Ampicillin/ gentamicin given at time of labor and delivery

*Weeks of gestation; **Detailed information was not given in the source; ***Time of ventricular drainage insertion. SVD – Spontaneous vaginal delivery; C/S – Cesarean section; VP – Ventriculoperitoneal; VA – Ventriculoatrial; VPL – Ventriculopleural; E3V – Endoscopic third ventriculostomy; N/A – Not available

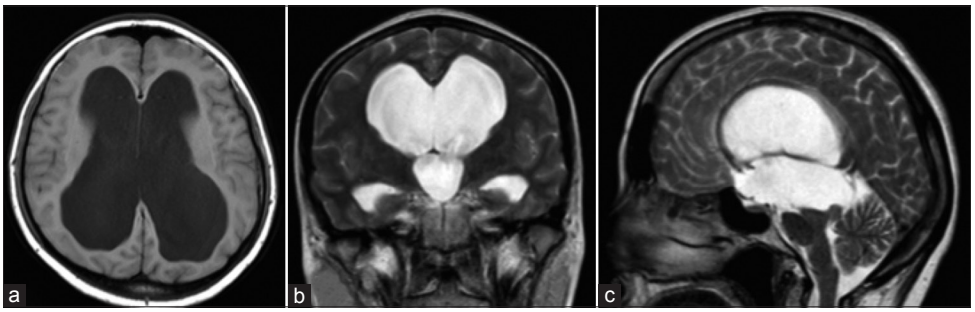

Figure 1: Hydrocephalus secondary to cerebral aqueduct obstruction is seen on T1-weighted axial (a), T2-weighted coronal (b) T2-weighted sagittal brain magnetic resonance images (c)

At the 6th month following her delivery, brain computed tomography (CT) depicted size of ventricles has decreased with a patent VP shunt function [Figure 2].

Discussion

Cerebral (sylvian) aqueduct is the most common intraventricular site for obstructive hydrocephalus.[15] Cerebral aqueduct stenosis contributes 6–66% of pediatric onset and 5–49% of adult-onset hydrocephalus.[16,17] Etiology is diverse as infectious (bacterial, viral), genetic X-linked, central nervous system malformations, head traumas, tumors, and hemorrhage.[15] However, only one out of each four cases has an underlying identifiable cause for stenosis. Remaining cases are named as "idiopathic." Cerebral aqueduct stenonis is a dynamic event affected with ongoing intracranial changes such as pregnancy in which many physiological changes occur, especially supratentorial cerebrospinal fluid (CSF) excess may disrupt the already tight aqueduct.[18] Based on this assumption, we should further understand physiological changes that occur throughout pregnancy.

Heart rate, cardiac left ventricular volume, cardiac output, central venous pressure, and total body water increase whereas mean arterial blood pressure, peripheral vascular resistance, and plasma oncotic pressure decrease in addition to hemodilution (approximately 10%).[13,19,20] In the brain, resistance to vasoconstrictor metabolites increases, blood brain barrier stability increases with increment in number of efflux transporter proteins, autoregulatory range of cerebral perfusion pressure increases (in animal models), cerebral blood flow (CBF) velocity decreases; hence, CBF increases (approximately 20%), selective remodeling of parenchymal arterioles (thinning of vessel wall with larger vessel lumen) happens, capillary density increases in the posterior circulation.[21-27] CSF volume also increases throughout pregnancy with venous dilatation.[4,13,28] All these changes may lead to increased ICP hence facilitate obstructive hydrocephalus by further narrowing the cerebral aqueduct, which is already tight just before the pregnancy.[6,18] Furthermore, some radiological changes are in progress during pregnancy. While the brain decreases in volume (4.1–6.6%), ventricular size increases (17.3–29.5%) until term. From delivery to 24th week postpartum, normalization in brain volume and ventricular size continues.[29]

In 14 pregnant patients with new onset hydrocephalus presented in the literature, nine patients had mass lesions and secondary hydrocephalus. Mean and median ages of the patients were 26.76 and 25 years, respectively (range = 20–39 years). Presenting symptoms

Figure 2: Postoperative brain computed tomography shows resolution of hydrocephalus following ventriculoperitoneal shunt insertion

were headache (most common), nausea and/or vomiting, depressed sensorium, seizure, memory disturbance, and vision problem.[3-14] Clinical presentation can be easily confused with preeclampsia.[6] In cases with concomitant brain tumor, tumor-related signs and symptoms were also observed.[7,9,10,14] Hence, imaging test in suspected cases should be conducted. In emergency circumstances, brain CT imaging is the best modality of choice. However, pregnancy is a contradiction for ionizing radiation; hence, MR imaging and neurological examination become vital tools of evaluation. Diagnoses of the mass lesions in nine patients were glioma, hemangioblastoma, meningioma, vestibular schwannoma, and neurocysticercosis infection. Shunt systems (8 VP, 1 ventriculoatrial, 1 ventriculopleural), endoscopic third ventriculostomy (three patients), and transient ventriculostomy (one patient) were preferred management tools for hydrocephalus in these patients. The patient with ventriculostomy had a revision surgery to turn to VP shunt after delivery. Mean and median times of intervention for hydrocephalus were 20.8 and 25 weeks of gestation, respectively (range = 7–35 weeks). All newborns were healthy at the time of delivery in cases where deliveries were conducted.[3-14]

After treatment of hydrocephalus, the next question will be which way of delivery is the best option for the patient. If the patient is in well status without any symptoms, spontaneous vaginal delivery will be a good option. In spontaneous vaginal delivery, the second stage of labor, which needs intense straining resulting in increased ICP should be kept at minimum. In unstable patients and in cases with obstetric indications, C/S under general anesthesia should be conveyed with motorization of patients' fluid status, central venous pressure. In severe cases, diuretics and steroid can be used. In circumstances with controlled ICP, epidural anesthesia can be conveyed during C/S.[3,6,30,31]

Although there is no comprehensive data recommending absolute use of peripartum antibiotics in patients with CSF shunts, some rare cases of shunt infection after vaginal delivery or C/S were reported.[32,33] There are contrary papers debating on prophylactic antibiotic use both in vaginal delivery and C/S for patients with CSF shunts.[3,6,34] During C/S, the abdominal tip of VP shunt can be contaminated directly or indirectly due to bacteremia, especially if there is a known colonization of the mother.[31,32] In the case of antibiotic prophylaxis, ampicillin (2 g I.V. for every 6 h) and gentamicin (1.5 mg/kg I.V. every 8 h) are the main treatment regimens with an ongoing 48 h of postpartum therapy.[6]

Postpartum shunt dysfunction and shunt infection risks were reported to be present until 6 months to 1 year.[6,33] Hence, continuous clinical follow-ups even after the delivery are necessary to prevent such complications in a timely manner.

Conclusion

Obstructive hydrocephalus is a very rare complication during pregnancy. Hydrocephalus becomes obvious and necessitates treatment before the third trimester of pregnancy. Timely diagnosis, especially differentiation from preeclampsia, is a life-saving step. If no complication happens during intervention for hydrocephalus, spontaneous vaginal delivery is a safe way of delivery for both mother's and newborn's well-being. C/S should be saved for obstetrical indications and can be conducted under epidural anesthesia if ICP is kept under control. Interdisciplinary approach of neurosurgeons and anesthesiologists is pivotal for delicate care of the patient and the baby.

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Conflicts of interest

There are no conflicts of interest.

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