Brain tumor in pregnancy: case report and literature overview

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ABSTRACT

Introduction: The incidence of brain tumor in pregnant women is estimated to be 1 in 1000–2000 pregnancies and it is similar for pregnant and not pregnant women. Incidence of malignant brain tumors is 3.6 per 1 million live births. Treatment and diagnostic of malignant brain tumor during pregnancy has a lot of specificity and it is a challenge for neurosurgeons and obstetricians.

The aim: To report the case of brain tumor during pregnancy and summarize literature overview about brain tumor management and treatment during pregnancy. Case: A 34-years-old woman presented at 38th week of pregnancy complaining of headache, dizziness, nausea and fever. Patient was diagnosed with giant brain tumor after computed tomography (CT) was performed. Multi-disciplinary team decided that patient has to deliver by cesarean section and after neurosurgery have to be performed.

Conclusion: It is important to select proper diagnostic and treatment method to minimize maternal and fetal mortality and morbidity. Diagnosing of brain tumor during pregnancy may be difficult due to similar symptomatic such as hyperemesis gravidum, preeclampsia, eclampsia or normal pregnancy condition. Management of women with brain tumor during pregnancy has to be approached by multi-disciplinary team.

Keywords: brain tumor, pregnancy, glioma, astrocytoma.

CASE PRESENTATION

34-year-old female at 38 weeks of pregnancy (gravida 2, para 2) presented at Vilnius University Hospital Santaros Klinikos (VUHSK) with headache, dizziness, nausea and fever. During the last 6 months of pregnancy she had three episodes of headache and dizziness. Her obstetric history consisted of one labor without any complications. Patient had no history of cancer in her family. She was consulted by obstetrician-gynecologist and there were no obstetric pathologies. After neurological counseling, a CT was performed which revealed brain tumor (Fig. 1, 2, 3). Multi-disciplinary team consisting of obstetrics and neurosurgery departments decided: vaginal delivery is contraindicated due to a giant tumor of the brain. Patient has to deliver by cesarean section (CS), brain surgery should be performed afterwards. Final treatment tactics should be considered after the magnetic resonance imaging (MRI), undertaken after CS. Diagnosis: Gravida 2, para 2, 38 weeks and 3 days. Cerebral tumor, unspecified.

At 38 weeks of gestation female newborn was delivered by cesarean section. According to Apgar scale she was evaluated by 9 points after 1 minute and by 10 points after 5 minutes. Patient was stable after CS, without focal neurological sights. MRI was performed after delivery (Fig. 3). Study was performed in T1, T2, FLAIR, T1+C sequences in sagittal, transverse, coronal planes with i/v Sol. Gadovist7.5 ml contrast. MRI revealed huge lesion in the right hemisphere, well marginted, involving deep white matter of temporo-occipito-parietal and limbic lobes with expansion to the interhemispheric cortex T1 - hypointense, T2/FLAIR hyperintense, without diffusion restriction. Lesions cause significant transfallic and uncal herniation with midbrain deforma-
tion, dislocation and deformation of ventricles with signs of asymmetric hydrocephalus and increased intracranial pressure. MRI results are suggesting low grade glial tumor. Multi-disciplinary team, including obstetricians, neurosurgeons, neurologists, decided to perform surgery. After CS, patient was treated in ICU for one day and two days in Obstetric department. Patient was treated with: adequate hydration, nonsteroidal analgesic and anti-inflammatory agents, anticoagulants, Sol Mannitol 15% 250 ml i/v 2 times per day, Sol. Dexamethason 8 mg 1 time per day, Tab Bromocriptin 2.5 mg 2 times per day. Three days after CS, patient and the newborn were released home (they both were in stable condition, without neurological deficit). No complications have been reported concerning the newborn during this period. There were several follow-up recommendations: continue taking Tab. Bromocriptin 2.5 mg 2 time per day for 14 day and Tab. Dexamethason 2.0 mg per day for 10 days.

Two weeks after delivery, second MRT was performed, which revealed no tumor progression (Fig. 4, 5). One month post-operatively, patient underwent operation: Craniotomia reg. P-O parasaggitale dex. extirpatio neoplasmatis. During operation extra biopsy was taken and histopathology results showed glioma. Operation was not radical, due to big mass of tumor. The pathology laboratory reported low grade diffuse glioma which can be further typed as diffuse grade II astrocytoma (World Health Organization). Immunohistochemistry of tumor cells revealed positive IDH-1 (30%) and GFAP (95%) expression. Few weeks after surgery patient showed complete neurological recovery and no adverse side effects. Further treatment will be prescribed after oncologist consultation.

Fig. 1, 2
Brain CT shows hypodense region in cerebral white matter with significant mass effect with subfalcial and transtentorial herniation. Lesion does not correspond to vascular supply regions and is suggestive of brain tumor.
Brain MR images: A) T1W image in axial plane, B) FLAIR (Fluid attenuated inversion recovery) image in axial plane, C) T2W image in coronal plane, D) DWI in axial plane. MRI reveals huge lesion in the right hemisphere, well marginated, involving deep white matter of temporo-occipito-parietal and limbic lobes with expansion to the interhemispheric cortex T1 - hypointense, T2/FLAIR hyperintense, without diffusion restriction. MRI with intravenous contrast injection showed central focuses of slight enhancement. Lesions caused significant transcalicine and uncal herniation with midbrain deformation, dislocation and deformation of ventricles with signs of asymmetric hydrocephalus and increased intracranial pressure. MRI results suggest low grade glial tumor.

DISCUSSION

Brain tumor diagnosis during pregnancy is rare. The incidence of brain cancer in pregnant women is estimated to be 1 in 1000–2000 pregnancies and it is similar for pregnant and not pregnant women [1]. Incidence of malignant brain tumors is 3.6 per 1 million live births. There is no accurate statistics for the prevalence of brain tumor during pregnancy in Lithuania. The most prevalent primary tumors according to literature are gliomas, followed by meningiomas, pituitary adenoma, choriocarcinomas and metastases of breast carcinomas [2, 3]. More frequently diagnosed cancers during pregnancy are breast cancer, cervical and hematological cancer.

Anatomic and physiologic changes during pregnancy can increase risk for intracranial tumors in pregnant women. There are a lot of problems with diagnosis, and treatment of brain tumors during pregnancy. Maternal blood volume increases during pregnancy, which can lead to increased cerebral blood flow and may be a reason of edema surrounding the tumor. Symptoms of increased intracranial pressure, such as headache, nausea, vomiting, neurologic signs and seizures can simulate symptoms of early pregnancy, or pregnancy related hypertensive diseases, like eclampsia or preeclampsia. According to literature, 27–41% of pregnant women suffer from repeating seizures caused by the brain tumor. Symptoms of brain tumor are primarily caused by mass effect [4, 5]. Main symptoms of our patient were: headache, dizziness, nausea and fever. No status epilepticus was diagnosed in our case. Rarely, early tumor progression may occur without any symptoms. Brain tumor progression accelerates during pregnancy due to multiple factors: hemodynamic changes, hormonal changes, increased level of growth factors and angiogenic factors (vascular endothelial growth factor (VEGF) and placental growth factor) [6]. Meningiomas progression is the most frequent due to a strong relationship luteal phase hormones [7]. Pituitary tumors are hormone-secreting tumors and studies with mice have showed that pregnancy also promotes pituitary tumor growth. Brain-derived neurotrophic factor (BDNF) has a big impact on promoting tumor progression by increasing the rate of the cell cycle, which leads to growth of the pituitary tumor cells in vitro and in vivo [8,9]. It is very important to differentiate if symptoms are pregnancy related or are caused by neural infections, or brain tumor. To confirm brain tumors diagnosis, MRI or CT has to be performed. The choice of imaging method depends on specificity during different trimester of gestation. The American College of Gynecology and Obstetrics recommends reviewing every pregnant patient case basis to assess risk-benefit ratio for performing MRI or CT. CT study radiation dose is generally too low to cause teratogenic effects and the risk of radiation exposure during pregnancy is a common concern. Missed/delayed diagnosis may cause a greater threat for pregnant woman and her fetus than any hazard associated with ionizing radiation. CT uses iodinated contrast, which can cross the placenta and enter the fetal circulation, or pass directly into the amniotic fluid. Animal studies have reported no teratogenic or mutagenic effects from using it. Main advantage of MRI is the ability to image deep soft tissue structures. MRI has no known risk to the fetus during second/third trimester of pregnancy. During first trimester of pregnancy MRI should be performed only after consultation with radiology faculty. MRI with contrast gadolinium-based agents or super paramagnetic iron oxide particles can be used for pregnant patients, but only for absolutely essential clini-
cal indication. Intravenous gadolinium-based agents are teratogenic in animal studies only at high and repeated doses [10]. It is good practice to avoid performing MRI for pregnant patients, especially during the first trimester, but MRI remains to be preferable to any studies using ionizing radiation.

Mutation of isocitrate dehydrogenase (IDH) 1 and 2 were discovered in gliomas just recently. Mutation of IDH1/IDH2 is a good prognostic factor compared to gliomas with wild-type IDH. IDH mutation may predict response to radiation and/or alkylating chemotherapy. Nowadays, detection of these genes mutation is very important and can be done by immunohistochemistry and magnetic resonance spectroscopy [11].

Treatment of malignant brain tumors ever during pregnancy is possible. It usually depends on gestational age of the fetus, symptomatology and tumor location. Treatment has to be started at any gestational week, as soon as disease is diagnosed. Options of treatment during pregnancy (surgery, radiotherapy or chemotherapy) should be discussed by multidisciplinary counsel in order to individualize it. According to our clinical case brain tumor was diagnosed at 38th week of gestation. Treatment tactic was discussed by multi-disciplinary counsel and it was based on gestational age and symptoms. Due to large tumor size, vaginal delivery was contraindicated and it was decided to deliver by cesarean section. It should be noted that no matter what type of delivery is chosen for the patient, epidural anesthesia is a contraindicated, due to possible cerebral herniation (because of a wet tap).

If the patient is diagnosed with brain edema (neurologically stable) it is important to start with symptomatic treatment by using glucocorticoids to reduce cerebral edema and increased intracranial pressure, and accelerate fetal lung growth. Also we need to control seizures. Prolonged use of glucocorticoids during pregnancy can cause fetal adrenal suppression, but there are more benefits using this type of treatment. Hypoxia and fetal acidosis, caused by convulsion is more dangerous, than the possible side effect of treatment. If the patient presents stable neurological conditions, surgical treatment may be performed at the third trimester. The optimal timing of the treatment options should be chosen for each patient by multi-disciplinary consult. After 30 weeks of gestation, surgery is considered to be safer. Intensive care after surgical treatment should be carried out by monitoring the patient during recovery from anesthesia, adequate analgesia (systemic or spinal opioids), prophylaxis against venous thrombosis [2]. After surgery, birth can be given by vaginal delivery or cesarean section, depending exclusively on the obstetric criteria. If the patient is diagnosed with neurological deterioration during the fetal maturation period, craniotomy has to be performed immediately. Cesarean section can be performed before or after craniotomy [12].

If we suspect diagnose of malignant glioma and prognosis of maternal survival is poor, surgery should be performed as soon as possible, no matter of gestational age [5,13]. Adjuvant therapies, including chemotherapy and radiotherapy improve the outcome of glioma and quality of life. If chemotherapy is needed in the first trimester, risks of this type of treatment should be taken into account, because all chemotherapy drugs can cross placenta. Chemotherapy in the first trimester is teratogenic and associated with adverse fetal outcomes. Therapeutic abortion should be considered. In the second and third trimesters of pregnancy chemotherapy is associated with minimal risks [14].

CONCLUSIONS

We present a case of pregnant women in the third trimester with a large diffuse brain glioma. Diagnosing brain tumor during pregnancy may be difficult due to the overlapping symptoms and can be confused with hyperemesis gravidum, preeclampsia, eclampsia or normal pregnancy condition. Every aspect of care, treatment strategies, imaging, have their specificity during different trimester of gestation. Management of pregnant women with malignant brain tumor has to be approached by multi-disciplinary team. To minimize maternal and fetal mortality and morbidity it is important to select proper diagnostic and treatment strategy.
REFERENCES


