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ABSTRACT

Introduction. Intracranial lesions during pregnancy are very rare conditions in obstetrical and neurosurgical practice. There is no precise protocol for the management of intracranial lesions during pregnancy yet. The aim of this study was to elaborate on pregnant patients with intracranial pathology in order to achieve better outcomes in the future.

Methods. This is a descriptive cross-sectional study conducted among patients presented with intracranial lesions at the Department of Neurosurgery at the National Academy of Medical Science, Bir Hospital. The data was collected retrospectively from hospital data thirty patients with intracranial lesions during pregnancy from 2015 to 2024. We analyzed the treatment decisions and obstetrical and neurosurgical outcomes. All patients were evaluated with either computed tomography, magnetic resonance imaging, or both.

Results. Among the admitted patients, the youngest patient was 20 years and the oldest was 42 years, of which 2, 13 and 15 patients were diagnosed in the first, second and third trimesters, respectively. The distribution of neurosurgical problems was as follows: subarachnoid haemorrhage (SAH) n=6, cerebral venous thrombosis (CVT) n=6, brain tumour n=5, trauma n=6, Intracranial haemorrhage (ICH) n=2, VP shunt n=2, tuberculoma n=1, neurocysticercosis n=1, and pituitary adenoma n=1. Fifteen patients (50%) underwent brain operation, eleven patients (36%) had conservative therapy, one patient died and four patients were terminated during pregnancy.

Conclusion. Multidisciplinary teams are not only required to successfully diagnose and treat intracranial lesions but also to safeguard both the mother and child.

INTRODUCTION

Intracranial lesions during pregnancy are very uncommon. Such kind of lesions can be life threatening for both mother and fetus. Anatomical and physiological changes lead to aggravate certain intracranial lesions. The biological changes including hormonal, metabolic, and immunological during pregnancy can stimulate women to a higher incidence of neurological problems like subarachnoid hemorrhage (SAH), stroke, pituitary apoplexy, venous sinus thrombosis, pseudotumor cerebri, neoplasms, pre-eclampsia and eclampsia etc. (4, 6, 13, 21) Such kind of complications in pregnancy bring special attention from super specialists due to the worsening of the clinical picture for both the mother and the fetus. There is not solid evidence

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whether brain lesions should be addressed during pregnancy or after termination of pregnancy, so there is controversy to the mode of management. This is a challenge for both the obstetrician and neurosurgeon. It is one of the alarmed forms of neurosurgical and obstetrical problems that not only causes significant morbidity and mortality but also results in poor socioeconomic outcome.

MATERIALS AND METHODS

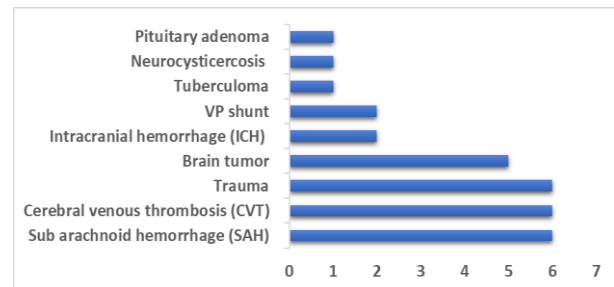
A retrospective study was done on thirty patients with intracranial lesions during pregnancy who were admitted to the neurosurgical department from 2015 to 2024. All patients were evaluated with either computed tomography (CT), or magnetic resonance imaging (MRI), or both. CT scan brain (non-contrast) was done as a part of routine evaluation with precautions when presented in the emergency department (ER). MRI Brain is the ideal diagnosis tool of intracranial lesions during pregnancy. Patient characteristics like age, gestation age, history of hypertension, GCS on admission, pupil reactivity, laboratory tests, CT scan and MRI results were evaluated. The consciousness level was measured by the Glasgow Coma Scale (GCS). Outcome assessment was based on the data from the medical records of patients during their hospitalization, Glasgow Outcome Score (GOS) and 6-month period after discharge. All the pregnant women with brain lesions were admitted in the neurosurgical intensive care during the study period and were comprised in the study. Postpartum women with intracranial lesions were excluded from our study. Our results are statistically analyzed with SPSS Software.

RESULTS

Two (7%) patients were identified in the first trimester, 13 (48%) and 15 (44%) patients presented in the second and the third trimester respectively. Their clinical features were focal neurologic symptoms (n = 10, 37%), epileptic seizures (n = 11, 41%) and others common symptoms like headache, nausea, vomiting (n = 8, 30). The distribution of neurosurgical patterns was as follows (Table 1): AVM / SAH aneurysm n=6 (figure 1), cerebral venous thrombosis (CVT) n=6, brain tumor n=5, trauma n=6, ICH n=2, VP shunt n=2, tuberculoma n=1, neurocysticercosis n=1, and pituitary adenoma n=1. We noted that three cases of aneurysm and 2 cases of AVM were managed surgically while one patient

died due to posterior fossa massive intracranial hemorrhage but the baby survived. All cerebral venous thrombosis (CVT) cases were managed conservatively. There were five cases of brain tumor which were managed with antiepileptic medicines, among them, four were histologically meningioma and one was low grade glioma. There were six trauma cases during pregnancy, among them two cases underwent craniotomy with spontaneous abortion, two cases underwent craniotomy with simultaneous early cesarean section, and two cases were conservatively managed. There were total of two cases of intracranial hemorrhage among which one case underwent evacuation and the other was managed conservatively due to minimum volume. Two cases of congenital hydrocephalus with ventriculoperitoneal (VP) shunt malfunction were managed with emergency VP shunting. Both cases of tuberculoma, cases of neurocysticercosis and pituitary adenoma were managed conservatively. All of these three cases were kept in regular follow up with extra precautions.

Table 1. Distribution of neurosurgical lesions during pregnancy



DISCUSSION

The first case of a pregnant woman with a brain tumor was well-defined by Bernard in 1898. Hagedoorn elaborated effects of pregnancy on intracranial meningioma in 1937 (19, 28, 30). The association between pregnancy and women with meningioma was first described by Cushing and Eisenhardt. Pregnancy may stimulate an underlying brain lesion by factors such as steroid mediated growth, hemodynamic changes and immunogenic changes. Fast growth tumors and its subsequent vasogenic edema can lead to raise intracranial pressure (ICP). However, the ideal time to decide operation during pregnancy is still controversial. It is highly praised to delay surgery if possible until after the first trimester to decrease the risk of miscarriage.

Surgery can be a life-saving or life-changing intervention during the second and third trimesters, (1, 5, 19).

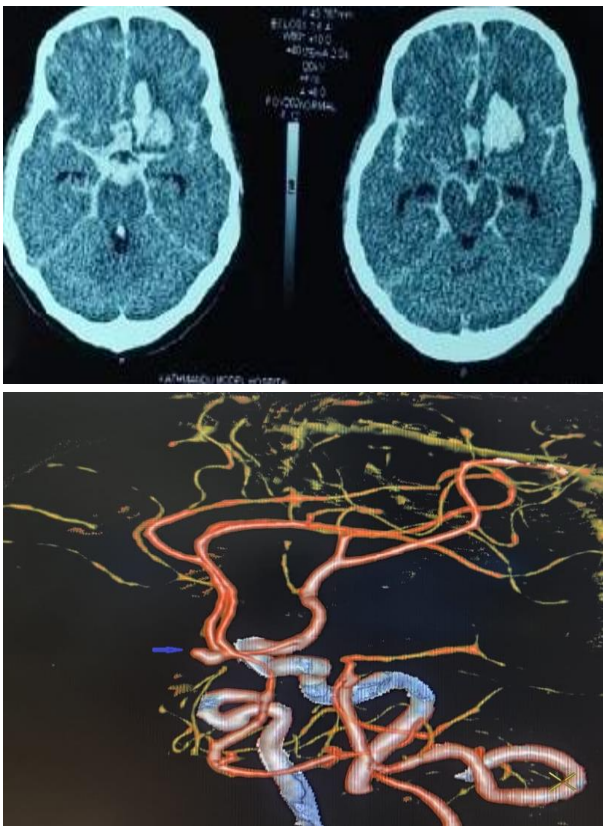


Figure 1. Preoperative axial computed tomography (CT) scans (A) showing diffuse subarachnoid hemorrhage with intra parenchymal hematoma and Computed tomography angiography (CTA) (B) demonstrating anterior communicating aneurysm

It is quite challenging to diagnose intracranial lesions during pregnancy. The clinical presenting of raise intracranial pressure like headache, nausea, altered sensorium, focal seizures, lateralizing neurological deficits, abnormal fundoscopic findings suggest an intracranial mass. Their management should not be misdiagnosed with chronic hypertension, gestational hypertension, hyperemesis gravidarum, pre-eclampsia or eclampsia or puerperal psychosis (10).

CT and MRI revealed the maximum number of diagnostic information. MRI is better over CT because of its greater sensitivity, higher image resolution and the absence of radiation. So, MRI brain is the ideal the diagnosis tool of intracranial lesions during pregnancy. The diagnosis of CVT should be assessed by MRI/magnetic resonance

venography (MRV) or CT venography. Homocysteine levels should be calculated, as homocysteinemia may be linked with peripartum CVT. These days, CT scan is not chosen of investigation to avoid the risk of radiation damage (2, 3, 8, 14).

In this study, there were five brain lesions, among them four of common histological type, meningioma, and one was low grade glioma, all of which were managed with antiepileptic medicines. meningiomas are known to express progesterone receptors, which leads to increased severity during pregnancy (12, 25). When superimposed on the physiologic changes of pregnancy, symptoms can be triggered and quite severe in pregnant patients. The management protocol for intracranial tumors during pregnancy should be depends on patient's presentation, gestational age, localization of the tumor, and others medical related factors. Surgical intervention is the best approach for intracranial meningioma but surgical plan should be avoided during pregnancy, when possible, because of the increased risk to both mother and fetus (16, 18). Postpartum surgery of meningioma is recommended by authors in the English literatures. (23, 26).

Cerebral venous thrombosis (CVT) accounts for 6% to 64% of all pregnancy associated strokes. It is related with a hypercoagulable state in 64% of cases and in 73% happened in postpartum (9, 27). Its presentation is same as others presentation like with headache, seizures, focal neurologic signs or ICH. IV heparin, fluid administration, antibiotics for infection, and measures to reduce the increased intracranial pressure are all used in management of CVT. Oral anticoagulation is usually given for 6 months in patients with idiopathic venous thrombosis and indefinitely in those with a persistent or familial thrombophilic state. Mortality from pregnancy associated with CVT is 10% to 50%, with a case-fatality rate in the range of 4% to 36%. (9, 20) The risk for hemorrhagic conversion has been used as the main limitation and dispute against anticoagulation. In our study, all cerebral venous thrombosis (CVT) cases were managed conservatively.

In our study, the most common non traumatic causes of SAH in pregnancy were due to underlying AVMs and aneurysms. There were six cases of non-traumatic SAH among which three were of aneurysm and 2 were of AVM, all of which were managed

surgically while one patient died due to posterior fossa massive SAH. The chances of aneurysm rupture increase several folds during pregnancy and increasing with gestational age until it peaks at 30 to 34 weeks. Dias and Sekhar (7) described that the mortality of pregnancy related aneurysmal SAH to be 35%, with a fetal mortality to be 17%. In a retrospective study of 118 patients, 90% of aneurysmal bleeding occurred during pregnancy, 2% during labor, and 8% postpartum. Six percent of AVM associated ICH occurs during labor and 94% during pregnancy. The treatment of SAH or ICH is not others than surgery during pregnancy. Before and after securing the aneurysm, these patients must stay in the neurosurgical intensive care with monitoring. Clipping of the aneurysm can be achieved in any stage of pregnancy and is related with lower maternal and fetal morbidity and mortality (11, 31).

Trauma is accounted in 8% of all pregnancies. It can be life alarming for both the mother and fetus. It is not only associated with maternal but also fetal morbidity and mortality. It has been elaborated that trauma increases the incidence of spontaneous abortion (SAB), preterm birth, preterm premature rupture of membranes (PPROM), placental abruption, uterine rupture, stillbirth and cesarean delivery (24). The rate of fetal mortality after maternal blunt trauma is 3.4 to 38.0 %, generally from placental abruption, maternal shock, and maternal death. Early evaluation and treatment of the mother in trauma should be addressed as soon as possible, as maternal shock is connected with 80% fetal mortality (15, 17). In our study, there were six cases of trauma during pregnancy. Two trauma cases underwent craniotomy with spontaneous abortion, two underwent craniotomy with simultaneously early cesarean section, and two cases were conservatively managed.

In our study, there were two cases of congenital hydrocephalus (HCP) which were previously shunted and presented with shunt malfunction. They presented with features of raised ICP, which was reconfirmed with MRI. Both cases were managed with emergency VP shunt surgery. HCP is a neurosurgical disorder that is defined as the presence of an abnormal collection of cerebrospinal fluid (CSF) inside the brain ventricles (22, 29). We consider spontaneous vaginal delivery to be the best way to terminate the pregnancy in HCP but

neurosurgical intervention is indicated in cases of acute neurological conditions. No standard procedure has been established yet for shunt malfunctions during pregnancy. However, low rates of shunt malfunctions and revisions were found in pregnant women.

A large retrospective population-based study of 644 patients diagnosed with intracranial lesions during pregnancy demonstrated no fundamental association between adverse outcomes and the neurosurgical procedures carried out during the immediate neonatal period. The management protocol for intracranial tumors during pregnancy should be adapted according to patient presentation and status. The general principle of surgery is cesarean section as first surgery and then the neurosurgical intervention when the patient's neurological status and the gestational age allow. (5,7,11). Our study recommendation is postpartum neurosurgical intervention when possible. Emergency neurosurgical interventions should be made in case of patients with malignant tumors, rupture aneurysm, active hydrocephalus or benign intracranial lesions with signs of impending herniation, and progressive neurological deficits. Finally, pregnant with brain lesions require an individualized approach of the institute for their care under the steering of multidisciplinary team. (12, 19)

CONCLUSION

Multidisciplinary teams including neurosurgeons, neurologists, obstetricians, perinatologists, anesthesiologists, genetics counselors and other health-care professionals' efforts are needed not only to successfully diagnose and treat the underlying pathology but also to ensure the safety of the mother and her unborn child.

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