ORIGINAL ARTICLE

GOAL ORIENTED ANAESTHETIC MANAGEMENT OF A PREGNANT PATIENT WITH BRAIN TUMOR POSTED FOR EMERGENCY CAESARIAN SECTION AND V-P SHUNT

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ABSTRACT: BACKGROUND AND OBJECTIVE: Pregnant women with brain tumors are uncommon; however pregnancy itself may aggravate the natural history of an intracranial tumor and may even unmask a previously unknown diagnosis. Small studies remain an important source of knowledge and experience and hence this study aims to highlight the major issues and provide an overview to the case of the pregnant patients with brain tumor posted for emergency caesarean section including pre-anaesthetic evaluation, patient counseling per operative management and follow up. **PRESENTATION, DIAGNOSIS, MANAGEMENT:** A 23years old G2P1L1 lady presented at 41 weeks gestation and was posted for emergency caesarean section, indication being post-dated pregnancy with previous caesarean section. She reported of being diagnosed with a brain tumor 6months back and that she has been suffering from severe headache associated with right sided facial palsy and bilateral hearing loss with severe papilledema. She confessed of her economic constraints because of which she couldn't get operated for so long. Following consultation between the anaesthetist, obstetrician and the neurosurgeon it was decided to proceed with caesarean section followed by V-P shunting under general anaesthesia. Rapid sequence induction and intubation was performed and was maintained with isoflurane, titrated to maintain the stability of mean arterial pressure until extraction. A live 2.6kgs female child was born with apgar scores of 8 and 9 at 1 and 5 mins respectively. Following extraction 10U oxytocin was given intramuscularly and 10U run as infusion in ringers lactate. Intra-operative analgesia was administered after extraction. After completion of caesarean section V-P shunting was performed by the neurosurgeon during which propofol and dexmedetomidine infusions were used. Post-operative period was uneventful. **DISCUSSION & CONCLUSION:** Anaesthetic management of brain tumor in pregnant women is mainly reliant on doctor's personal experience as no evidence based guidelines are available. General anaesthesia using thiopentone, propofol, fentanyl, dexmedetomidine and titrated dose of isoflurane as used in our case were found to be safe with adequate hemodynamic stability and post-operative pain control. A team approach involving the anaesthetist, obstetrician, neonatologist and neurosurgeon is recommended for appropriate management of such parturient.

KEYWORDS: Brain tumour, caesarian section, ventriculoperitoneal shunt, general anaesthesia.

INTRODUCTION: The first published report of brain tumor diagnosed in a pregnant patient was written by Bernard in 1898. It was recognized more than 100 years ago as a complex problem and remains as such today. There was very limited anaesthetic experience to guide the management of such patients. Pregnancy may increase the growth of a previously existing intracranial tumour and can even unmask a previously undiscovered tumor. It was suggested that immunological tolerance and steroid mediated growth led to this exacerbation during pregnancy. In this case we describe the

ORIGINAL ARTICLE

anaesthetic management of a primipara with brain tumor posted for emergency caesarean section and subsequent V-P shunting.¹⁻³

PRESENTATION, DIAGNOSIS, MANAGEMENT: A 23years old G2P1L1 diagnosed with acoustic schwannoma presented at 41 weeks of gestation and was posted for an emergency caesarean section along with V-P shunt placement. She reported of having severe headache in the occipito-frontal region associated with projectile vomiting which used to subside temporarily with pain killers. It worsened over past 6months because of which she consulted a neurologist, underwent a MRI and thus diagnosed with acoustic schwannoma.

She revealed that her present pregnancy was detected by positive UPT only 3 days after being diagnosed with the brain tumor and hence her first trimester had gone unnoticed. She confessed of not being able to undergo surgery for her ailment because of financial constraints in spite of prompt advice by her neurologist. She also reported of right sided facial palsy with bilateral hearing loss since 3months which developed rather suddenly.

She admitted of having similar complaints of facial palsy 2years back which coincided with the 2nd trimester of her first pregnancy for which she was not properly evaluated and symptoms had subsided after taking treatment from a local hospital for 15days. She admitted to have undergone caesarean section in her first pregnancy in view of non-reassuring fetal status under spinal anaesthesia and that the child was admitted in NICU for 7days. There were no reports of any complication following sub-arachnoid block.

On presentation she was 150cms tall, 54kgs, alert; not able to interact because of profound hearing loss and hence her mother was the informant and the information given by her was reliable. Her pulse rate was 96bpm, blood pressure 142/64mmHg and oxygen saturation 98%in room air. Airway examination revealed Mallampatti class 1 airway, thyromental distance was more than 6.5cms, inter-incisor gap was more than 6cms, neck circumference 34cms, adequate neck and temporomandibular joint movement, upper lip bite test –grade 1 and no spine abnormality detected.

Central nervous system examination revealed decreased field of vision in right eye, nystagmus on horizontal movements towards the right side in right eye, decreased corneal reflex in right eye, deviated angle of the mouth to the left with decreased eye closure on right side. Her vestibulocochlear nerve could not be assessed as she could not comply to the instructions given to her. Ophthalmoscopic examination revealed severe papilledema. Her motor and sensory functions were normal and cerebellar functions were normal. Cardiovascular and respiratory system findings were unremarkable. All her investigations were within acceptable limits and by the end of her pre-anaesthetic evaluation she was classified as ASA class III.

Following consultation with the obstetrician, neonatologist and the neurosurgeon the decision was made to proceed with caesarean section followed by V-P shunting under general anesthesia. After obtaining an informed consent from the patient and her attender, she was shifted to the OT in left lateral position. A large bore 18 G IV cannula was secured in both dorsum of the hand and a rapid infusion of ringers lactate was administered through one line.

Anti- aspiration prophylaxis given with 50mg IV ranitidine and 10mg metoclopramide. Multi-parameter monitors were then attached to the patient that consisted of pulse oximetry, NIBP and ECG. The initial BP showed 150/68 mmHg, ECG showed sinus rhythm and heart rate of 90bpm and oxygen saturation in room air was 98%.

ORIGINAL ARTICLE

Pre-oxygenation was carried out for 3mins. A rapid sequence induction was performed with 250mg thiopentone and 50mg rocuronium and airway was readily secured with 7.5 no cuffed endotracheal tube. Intubation response was well attenuated with Inj. lidocaine 1.5mg/kg given 90 seconds prior to laryngoscopy followed by gentle and rapid intubation within 10 seconds of laryngoscopy.

Correct placement of the tube confirmed and anesthesia maintained with 66:33 mixture of oxygen and nitrous oxide and isoflurane 1% with constant monitoring of MAP; while giving positive pressure ventilation through Bains circuit. Oxygen saturation was 100% and ETCO₂ was 34mmhg. 5 minutes following skin incision a live female baby was extracted which weighed 2.6kgs and its APGAR score were 8 and 9 at the end of 1 and 5 minutes respectively. Following delivery 10U of oxytocin infused through ringer lactate and 10U administered intramuscularly.

After extraction intra-operative analgesia was given with 100ug of fentanyl and diclofenac infusion started through the IV line. Antiemetic drugs ondansetron 4mg and dexamethasone 8mg were also administered. After completion of caesarean section patient was positioned for V-P shunting in reverse trendelenberg position with slight flexion of the neck towards the right. 100mg hydrocortisone was administered before the surgery began and once it commenced patient was cut off from Isoflurane which was by then had already been reduced to 0.4%.

Propofol bolus 1mg/kg followed by infusion of 100microgram per kg per minute and was continued for initial 10minutes of the procedure. Dexmedetomidine infusion was simultaneously started through another IV line at 0.6ug/kg/hr while thoroughly monitoring the hemodynamic parameters. As the neurosurgeon closed in towards burr hole completion adequate brain relaxation was provided by 20%mannitol infusion and 20mg of furosemide. ETCO₂ was continuously maintained in the range of 25- 28mmHg throughout the course of V-P shunting.⁴

As the surgery neared completion dexmedetomidine infusion was stopped 5 minutes prior to completion of surgery. Patient had good analgesia and depth of anaesthesia throughout the course of surgery marked by minimal changes in hemodynamic parameters. Patient had a gentle emergence after administration of 2.5mg Neostigmine and 0.4mg Glycopyrrolate. Postoperatively her pulse was 86bpm, BP-126/70mmhg, ETCO₂- 34mmhg and saturation 97% in room air.

Her PACU stay was uneventful and she admitted to have great relief from her headache. Neonate was handed over to the mother in PACU from where she was shifted to post-partum ward within 6 hrs. Patient was discharged after 1 week and advised to review with the neurosurgeon for the definitive management of the tumor.

DISCUSSION: Primary central nervous tumors occur in approximately 6 in1, 00, 000 females of reproductive age group.¹ In 1988, Simon postulated a theory to predict the prevalence of brain tumors in pregnant patient by means of a probability based calculation. Based on this theory the author calculated that in USA there are about 89 pregnant women who harbor a brain tumor.^{2, 5}

Most studies suggest that the relative frequency of brain tumors is not altered by pregnancy. However a body of literature exists which supports the fact that pregnancy may increase the growth of a previously existing intracranial tumor and can even unmask a previously undiagnosed tumor. This has been attributed to the hormonal milieu of pregnancy that may influence the growth of some tumors due to increased blood volume, redistribution of total body water between the intracellular and extracellular fluid compartments and the influence of steroid hormone. These changes may result

ORIGINAL ARTICLE

in increased tumor size, consequent compression on surrounding structures and changes in the intracranial pressure.^{1,6} Idiopathic facial nerve palsy occurs in 17 per 1,00,000 in women of reproductive age and 38-45 per 1,00,000 during pregnancy and post-partum period. During pregnancy, 75% of the cases are seen in the third trimester and post partum period. Also recurrences during successive pregnancies and bilateral facial nerve palsy in pregnant women have also been described. Prognosis for recovery is excellent with 40-60 mg steroids over a 10 day course.⁷

The diagnosis of brain tumor requires imaging and in pregnancy MRI is the preferred imaging modality because of its greater resolution, increased sensitivity and lack of ionizing radiation. MRI scanning without iv contrast has been found safe for both mother and the fetus. However in centers where CT scanning is the only imaging modality, it can be safely performed by abdominal lead shielding techniques. It is advantageous over MRI in cost, accessibility and availability while its usage of radiation to obtain images and lower resolution makes it a second choice of imaging modality. Also iodinated contrast used in CT scan can cause nephrotoxicity and allergic reactions in mother while causing hypothyroidism in the fetus.^{3, 8-10}

There are no preformed guidelines for the management of intracranial tumors in a pregnant woman coming for emergency caesarean section.^{2,11} So our anaesthetic plan was designed to ensure both maternal and fetal well-being. In term pregnant ladies who are unstable it is recommended to use general anaesthesia to deliver the baby by C- section followed by surgical decompression.¹² After discussion with the patient, obstetrician, neonatologist and the neurosurgeon we decided that the safest way to tackle this case was to go ahead with general anaesthesia with rapid sequence induction and epidural anesthesia was not considered.

With epidural anaesthesia there is always a possibility of dural puncture which could potentially alter the CSF pressures and also contaminate it. The volume of lumbar epidural injection has been related with increased ICP by a CSF shift to the brain and neuraxial blocks also produce sympathetic block which can result in decreased brain perfusion as a result of hypotension. Inadvertent dural punctures may have disastrous consequences and even deaths have been reported.¹

MANAGEMENT ISSUES: Aspiration prophylaxis is considered important before anaesthesia during pregnancy. Also rapid sequence induction is carried out to further reduce the risk of maternal aspiration.^{1,13}

Corticosteroids are recommended drugs in brain tumors as they are comparatively safe in pregnancy, alleviates vasogenic edema surrounding the tumor and also promotes fetal lung maturity.^{2,11,14}

Thiopentone sodium is still the frequently used IV induction drug of choice in pregnancy for general anaesthesia and we chose it because of its coupling effect of decreased cerebral blood flow followed by decreased metabolic rate and thereby decreases intracranial pressure thus maintaining adequate cerebral perfusion pressure.^{1,15}

As we considered caesarean section first, propofol was not used as the induction agent it has a direct relaxing effect on the gravid uterus and also critically decreases cerebral perfusion pressure.¹⁶ So we avoided propofol as induction agent, but after extraction of the baby for 10 minutes we used propofol as a infusion along with dexmedetomidine infusion.

ORIGINAL ARTICLE

As succinyl choline is found to be associated with raised ICP,¹ we went for rocuronium as the muscle relaxant which produced an equally optimal intubating conditions within 60 seconds at a dose of 1.2mg/kg without producing any significant elevation in ICP. Though controversial use of rocuronium has well been suggested by several authors in neurosurgical procedures. Rocuronium in the dose of 0.6mg/kg was found to produce good excellent intubating conditions for caesarian section after 6mg/kg thiopentone by Abouleish and also by Larsen et al.

Oxygen 100% was administered initially during pre-oxygenation for 3 minutes and later after intubation, until extraction because it results in higher umbilical venous oxygen saturation and higher APGAR scores,¹⁷⁻¹⁹ Patient was maintained in deeper planes of anaesthesia during C-section with 1% isoflurane while constantly monitoring the hemodynamic parameters. Then after substitution of fentanyl, propofol and dexmedetomidine we completely avoided nitrous oxide.

Dexamethasone has been traditionally used to reduce cerebral edema. It is safe to use in an acute setting and it is recommended in order to avoid seizures that may lead to maternal and fetal hypoxia and acidosis.²

Fentanyl was used as the analgesic agent in our case in a dose of 2ug/kg immediately after the extraction of the child. As fentanyl easily crosses the placental barrier and takes longer time for metabolism it can produce profound neonatal respiratory depression. Hence it was administered after the child was delivered. The attenuation of airway reflexes at the time of laryngoscopy was brought about by maintaining a deeper planes of anesthesia with isoflurane and by administering Inj. Lidocaine 1.5mg/kg 90 seconds prior to intubation and duration of laryngoscopy just 10 seconds. We were able to obtund the airway reflexes with pharmacological ablation of sympathetic response as well as by performing a rapid and a gentle laryngoscopy.

Use of dexmedetomidine has also very well been recommended in pregnant patients.^{2,20} So we used Dexmedetomidine in the dose of 0.6 micrograms per kg per minute with propofol in the dose of 1mg/kg bolus followed by 100 micrograms per kg per minute for 10 minutes, then we discontinued the propofol infusion but continued dexmedetomidine infusion, because dexmedetomidine takes 5-10 minutes for its onset of action and 15 minutes for the peak effect.

Oxytocin has been used in patients with intracranial tumors without any adverse effect.^{2,5} On the other hand ergotamine should be avoided in these patients as it can increase the ICP and cause hemorrhage.^{2,16}

Anaesthetic management using Thiopentone sodium, Propofol, Dexmedetomidine, Isoflurane, concurs with the study done by Estilita et al and Alaa abd-Elssayed et al. Though Rocuronium use is controversial, because this patient had full stomach, Papilledema with severe raise in ICP, so instead of suxamethonium we used rocuronium for rapid sequence intubation weighing the risk- benefits.

Also postoperatively multimodal analgesic approach was chosen so that the patient had optimal pain relief with fewer side effects.

CONCLUSION: Brain tumors in pregnant ladies is challenging because of a combination of factors including their diagnosis, nuances of maternal physiology, fetal viability and complexity of surgical and anesthetic interventions. Management is mainly reliant on doctor's personal experience and therefore a close communication between the anesthesiologist, obstetrician, neurosurgeon and neonatologist is crucial to achieve good outcomes.

ORIGINAL ARTICLE

Maintenance of hemodynamic stability and control of ICP are the major goals in managing these cases and hence a well-defined management goals should be outlined and anesthetic technique tailored to meet these goals. In our case general anesthesia with thiopentone, propofol, fentanyl and dexmedetomidine and titrated dose of isoflurane were found to be quite safe.

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ORIGINAL ARTICLE

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Monitoring

Mother and new born

MRI scan of acoustic schwannoma

MRI scan of acoustic schwannoma

ORIGINAL ARTICLE

Patient with fascial nerve palsy

Patient with v-p shunt

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