THE HIGH RISK OBSTETRIC PATIENT – ANAESTHETIC IMPLICATIONS

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The physiological changes associated with pregnancy makes anaesthetic management of even the normal pregnant patient riskier than non-pregnant patients. Pregnancy is considered "high-risk" when accompanied by any condition unfavourable to the well-being of the mother, foetus or both. While in the past, women with medical problems did not survive child bearing age, today we have women with renal and cardiac transplants coming for delivery. Progress in infertility treatment has also led to older women with intercurrent medical conditions achieving full term pregnancies. Anaesthetising these patients is still quite a challenge despite all the advancements in medicine, surgery and anaesthesia.

Medical disorders along with pregnancy

- Morbid obesity
- Asthma and other Respiratory disorders
- Diabetes mellitus
- Congenital or acquired cardiac conditions – MI, Cardiomyopathy, Rheumatic heart disease.
- Chronic renal failure,
- Hematological -ITP, Sickle-cell disease
- Drug abuse

Maternal problems may be related to pregnancy

- Hypertensive disorders of pregnancy (7%) - Pre eclampsia, eclampsia, HELLP syndrome
- Embolism during pregnancy - Venous air embolism, Amniotic fluid embolism, Pulmonary embolism
- Acute Fatty Liver of pregnancy

During labor and delivery

- APH/PPH from placenta previa/abruptio
- Uterine rupture (precipitous labor)
- Uterine atony & inversion
- Placenta accreta & retained placenta
- Intrauterine infection and sepsis

The non-obstetric causes

- Trauma,
- Surgery during pregnancy – laparoscopic, GI- appendicitis, cholecystitis
- Foetal surgery
- Iatrogenic – medication errors and allergies
- Anesthetic complications

All the above can be accompanied by foetal problems

- Pre and Post-maturity
- Intrauterine growth retardation
- Multiple gestation
- Foetal malpresentations
- Cord compression

In general, anaesthetic management of the high risk parturient is based on the same considerations as in a healthy mother or foetus which would include maintenance of maternal cardiovascular function and oxygenation, improving utero-placental blood flow and delivery of an infant without significant drug effects. This problem is more difficult in the high risk pregnancy because many of these functions are already compromised before anaesthesia. Each of them has specific pathophysiology and treatment may require involvement of the physician and intensivist. One important consideration is that these parturients are on a variety of drugs and treatment, so the anaesthetists should be made well aware of all this before induction of anaesthesia, and they should be familiar with potential interactions between these drugs and anaesthetic drugs and techniques.

Morbid Obesity

Failure to secure the airway and loss of airway due to difficult airways are increased in this group, the incidence of failed intubations in normal parturients is 1:300 vs. 1:2500 in the normal patient. The distortion of airway anatomy, oedema of the upper airway mucosa and tongue, respiratory changes in pregnancy, bleeding due to hypervascularity of airway are all exaggerated in obesity and pre-eclampsia. Skilled help is essential in event of failures. Practice guidelines, Difficult Airway Algorithms and Failed Intubation Drills should be familiar to all anaesthetists. In a "can't ventilate, can't Intubate" situation, other options like Awake Intubation, Regional Anesthesia or Local Anesthesia should be employed. The Anaesthetist should be familiar with the newer supraglottic and infraglottic airway devices like LMAs, Combitubes and Transtracheal jet ventilators. Awake intubation can be done with fibroptic bronchoscopes or by direct awake laryngoscopy with good local anaesthesia.

The decreased barrier pressure between the lower oesophageal and intragastric pressure and delayed gastric emptying can increase the incidence of gastro-oesophageal reflux and pulmonary aspiration and its consequences. The increased gastric acidity, muscle relaxation and loss of protective airway reflexes with GA or "Total Spinal" with regional anaesthesia can increase their incidence. The Sellicks manoeuvre or cricoid pressure for rapid sequence intubation in full stomachs to prevent the reflux cannot be applied effectively because of the increased neck tissue and oedema. Aortocaval compression due to the gravid uterus and the supine hypotension syndrome makes it difficult to maintain maternal cardiac output and utero-placental flow. If not prevented and timely corrected, it can result in maternal and foetal mortality. Cardio-pulmonary resuscitation in pregnancy may be difficult due to the lateral positioning and difficult airway. Peri-mortem caesarean delivery is considered when the foetus is viable. The Cardiff Resuscitation wedge is also useful to maintain the tilt and maintain effective CPR.

Regional techniques are the optimal choices to avoid airway problems. Neuraxial blockade like epidurals and spinals can be done as long as there is no contraindication to these and in absence of coagulopathies. They can be initiated early in labor and continued. Walking epidurals are very popular nowadays. Good pain relief can be achieved throughout labor, avoiding the airway problems, neonatal depression and GA even in emergency LSCS if an epidural catheter is sited early in labour. Spinal has quicker onset but can cause precipitous hypotension, though it has been used successfully

for years especially in combination with intrathecal opioids like morphine, diamorphine, fentanyl to decrease the LA dosage, prolong the action of LA and decrease the incidence of postdural puncture headache (PDPH). The incidence of PDPH is higher even in normal parturients compared to normal patients. (1.2% even with noncutting Whitacre spinal needles).The advantages of an epidural block is the slow onset of action which gives enough time to preload, titrate fluids and vasopressors and maintain pressures while avoiding drastic changes in BP which can be deleterious in an already compromised mother and foetus. It has been found to be safe even in pre-eclampsia and most of the other disorders, if blood pressure is maintained. Patient Controlled Epidural Analgesia (PCEA) is routinely employed with newer LA drugs like ropivacaine and levo- bupivacaine which have lesser motor and cardiotoxic effects. Combined spinal epidural (CSE) is useful especially in late labour to achieve fast pain relief and can be continued as required even for post-op analgesia.

Asthma:

This most common respiratory disorder associated with pregnancy can be a nightmare to the anaesthetist even in a nonpregnant patient. Adequate control of asthma during pregnancy is important in reducing potential risks. Goals are improving pulmonary function, by prevention of acute attacks of asthma and its aggressive treatment. Inhaled β_2 agonists and corticosteroids have become the norm due to decreased incidence of systemic side effects. If I/V steroids are used to for control of severe attacks or status asthmaticus, then steroid supplementation just before induction of anaesthesia is required in case of adrenal suppression. But if LSCS is urgent and GA is considered, the β_2 agonists can interact with potent inhalational agents like halothane. Though good bronchodilators, they can sensitise the myocardium and cause dysrrythmias. Induction agents like thiopentone can provoke laryyngospasm and bronchospasm. We now have better agents like propofol and also bronchodilators like ketamine for induction. Non-histamine releasing Neuromuscular (NM) agents like vecuronium and not atracurium, opioids like fetanyl rather than morphine or pethidine and also avoidance of NSAIDs which can provoke bronchospasm should be considered. Prostaglandins F are best avoided though PGE are safe. Theophyllines and pesudoephedrine, used to treat bronchospasm, can cause foetal tachycardia and cardiac irritability; Short-acting β-agonists like terbutaline are probably safest.

Epidural analgesia with LA and opioids would be the best choice for labour analgesia and anaesthesia again for all the reasons mentioned above and to prevent irritation of airway. High blocks should be avoided in case they have to be converted to GA which would have to be instituted urgently in less optimal conditions. Many conditions can mimic an attack of bronchospasm under GA from dyspnoea of pregnancy, pulmonary oedema to the dreaded amniotic fluid embolism. Low foetal oxygenation is of prime importance here and systemic drugs to control the attacks like adrenaline has teratogenic effects and β-agonists can precipitate pulmonary oedema. Helium–oxygen mixtures have found to be useful in these conditions. Severe cases would require intubation and ventilation. Non-invasive ventilation may not be possible here due to the gastric reflux problems. If the baseline maternal alkalosis is worsened, foetal hypoxia can develop. Respiratory acidosis develops even with $PaCO_2$ as low as 28-32 mmHg. Permissive hypercapnia now practised in ICUs for ventilation can cause foetal acidosis and shift to the right of the foetal Hb curve in pregnant patients. Deep plane of Anesthesia is required to prevent laryngo and bronchospasm in these under GA. This may cause difficulties in extubation of these patients.

Diabetes Mellitus:

This is another common disorder of pregnancy; perinatal mortality is quite high in this group. Pregestational diabetes has different problems from gestational diabetes. Microangiopathic complications and end organ damage should be actively sought for. Retinal, renal, autonomic neuropathy, hypertension and silent MI are accompaniments. Autonomic neuropathy can cause intractable vomiting and poor metabolic control as also profound hypotension with regionals. Tight glucose controls are mandatory for foetal well being and glycosylated haemoglobin would give an indication of adequate control. β-agonists and steroids, given to prolong delivery and for foetal maturity, can cause insulin resistance, sodium and water retention and hypokalemia with uncontrolled glucose levels. After delivery of baby, insulin doses should be regulated to prevent fatalities from hypoglycaemia as insulin requirements fall rapidly to less than prepregnant doses. Diabetic babies are monitored and treated appropriately. Regionals are very popular, spinal anaesthesia is accepted in most cases with avoidance of hypotension and appropriate fluids.

Cardiac disorders:

Though the incidence of rheumatic fever has came down, the proportion of pregnancies with corrected congenital heart disease (CHD) have increased as also the number of women with IHD. Many women are unaware of the cardiac problem until well into pregnancy. The unique problems with these patients are:

-The increase in IV volume which is poorly tolerated when CO is limited.

-Decrease in SVR can increase R to L shunts

-Hypercoagulability mandates need for adequate anticoagulation.

-Anticoagulants increase risk of peripartum haemorrhage and Regional Anaesthesia.

-The marked fluid shifts during labour and delivery is poorly tolerated leading to pulmonary oedema and decompensation.

-Antibiotics for infection and endocarditis prophylaxis is considered.

If valve replacements are required, biovalves or homografts would be best to avoid the need for anticoagulation. Care should be taken to minimise acute changes in BP, PR and blood volume. Venacaval occlusion and decreased venous return is avoided by upright or left lateral position. Prolonged second stage is avoided. Valsalva manouvres can decrease CO and increase CVP and SBP. Adequate analgesia required to prevent catecholamine release due to pain and anxiety. Intensive monitoring is continued post-partum as this is a crucial time for cardiac decompensation. Epidural analgesia is given ideally to minimise HR, BP and hemodynamic effects caused by pain and catecholamine release but has to be instituted carefully to avoid decreases in SVR and BP. IV fluids administered with care, rapid hydration and preloading may not be tolerated like normal women, vasopressors may be more useful-ephedrine and titrated doses of phenylephrine I/V have been used successfully. Spinal anaesthesia can cause preciptious drop in BP and SVR, so best avoided in cardiac patients. Cardiac stress leading to death occurs in the 3rd trimester, during labor and delivery. These stressful times have to be managed very carefully.

Management is specific for specific lesions. Mitral Stenosis is the most common lesion encountered in our country. Being a relatively fixed cardiac output state, pulmonary oedema can occur, mostly at 28-32 weeks when blood volume is maximum and during labour when fluid shifts are maximum. Intensive monitoring and early treatment of pulmonary oedema are necessary. In atrial fibrillation and patients on anticoagulants with heparin or low molecular weight heparin, epidurals may be a problem. Regionals are contraindicated unless these are electively stopped and guidelines followed especially the timing of epidural catheter insertion and removal or permanent neurological complications can occur. For LSCS, titration

of LA dose is essential. Regurgitant lesions like AR and MR are usually well tolerated in pregnancy unlike fixed output and cyanotic conditions. Epidurals would help to reduce cardiac afterload. Bradycardia should be avoided or the regurgitant fraction will increase. MVP is frequently seen but is not much of a problem unless associated with MR. Inhaled NO for increased PVR is helpful. Pulmonary embolism and edema are risks during early post partum and should be monitored. Intensive, invasive monitoring and prolonged ICU care may be required.

Hypertensive disorders of pregnancy:

Pre-eclampsia and eclampsia are most dangerous of the hypertensive disorders. Eclampsia is the third common cause of death in pregnancy. PIH patients are on various antihypertensives like methyl dopa, hydralazine or Ca channel blockers. β-blocker therapy leads to IUGR, neonatal hypoglycaemia and hypothermia. Diuretics are best avoided unless super imposed pulmonary oedema ensues. Cerebral oedema and hypoperfusion are causes of cerebral symptoms. Hepatic involvement is common in pre-eclampsia which may affect metabolism and elimination of drugs. Amide LA action may be prolonged; care should be taken with repeated administrations. Prevention of seizures is the goal. This is achieved by magnesium sulphate whose safety has been established but can pose problems for the anaesthetist. Airway oedema due to decreased colloid osmotic pressure and increased intravascular permeability, hypertensive responses to laryngoscopy and difficult intubation are problems. They have generalised vasoconstriction which mandates vasodilatation and titrated volume expansion, rapid correction can lead to pulmonary oedema. Antihypertensives and anticonvulsants may have to be continued upto 12 weeks of delivery. Problems of maternal and foetal hypermagnesemia should be considered, these mandate monitoring and reversal with calcium gluconate if necessary.

Invasive monitoring – arterial, venous, urine output, sometimes even a pulmonary artery catheter is required for fluid and cardiac management. With GA, exaggerated responses to laryngoscopy and hypervascularity can lead to cerebral haemorrhage, largyngeal oedema and airway bleeding. Hydralazine, SNP, GTN, labetolol, $MgSO_4$, Beta and Calcium channel blockers have all been used to obtund these reflexes. All these have foetal effects including short acting Esmolol. $MgSO_4$ can compound hypotension but usually not a problem if monitored carefully. It can potentiate action of NM Blocking drugs; a nerve stimulator for neuromuscular monitoring will help. Ketamine and drugs which increase BP are avoided. They

exhibit increased vascular reactivity to catecholamines leading to decrease in placental perfusion. Epidurals have shown to increase intervillous blood flow. They are better choices as they prevent the haemodynamic fluctuations and pulmonary oedema. Decreased platelet counts below 1 lakh(or 80,000) is a contraindication for regionals. The rapidly changing platelet counts are the problem. TEG and coagulation screens may be important but epidural is instituted as soon as platelet counts are available. Spinals may exaggerate hypotension; this can decrease uterine blood flow on an already compromised foetus. Neuraxial opioids along with decreased LA dosage can be used safely.

Patient–controlled analgesia (PCA) intra-venously and inhalational PCA with entonox and inhalational agents like 0.25% isoflurane or 1% desflurane have also been used with good results though sevoflurane seems to attenuate the nitrous oxide effects. These are especially useful in spinal deformities and other surgeries during pregnancy.

Pulmonary Embolism and pregnancy:

These patients are on thrombolytic therapy, have had embolectomy and are on IVC filters. Most of them are on anticoagulants, heparin is safe. HIT should be looked for. LMWH is becoming more popular for anticoagulation. Screening for factor Xa activity is not recommended as a routine. Proper guidelines for discontinuation of these before regionals and especially when the epidural catheters are being removed should be considered. Haemorrhage and proper replacement of blood products are essential. In massive PE, right heart strain is common, vasopressors and inotropes may be necessary. Vasoconstictors like adrenaline, noradrenaline and large doses of phenylephrine are best avoided. Amniotic fluid embolism is the most dangerous of these and now referred to as 'Anaphylactoid Syndrome of Pregnancy' as it causes multisystem reaction to toxins with lethal consequences, multiorgan failure, DIC and even mortality. Permanent neurological deficits are a possibility, cerebral resuscitation, neuro protection and prolonged ICU care with cardiac and ventilatory support are required. Complications should be best prevented. Pulmonary oedema and haematological abnormalities are main problems. Prompt and aggressive treatment required.

Obstetric bleeding emergencies:

The obstetric haemorrhages like PPH, APH, uterine atony may all require emergency hysterectomy for uncontrolled haemorrhage and cause severe hypotension. Intensive, invasive monitoring and prompt volume replacement are most important considerations. Adequate blood products have to be arranged. Placenta accreta and retained placenta would require some uterine relaxation which cannot be possible with regionals alone. GA and uterine relaxation with inhalational agents are usually employed. If a functional epidural is already established, I/V nitroglycerine in titrated doses have been successfully used along with regionals for relaxation of uterus. Similar guidelines as above should be used in other high risk obstetric patients.

Anaesthetic Complications:

Though Anaesthesia has become much safer today with better drugs and wider options, anaesthetic complications are still considered the sixth leading cause of maternal death in the US. 50% is due to airway problems with GA, 25% due to complications with regionals. 70% of these are due to epidurals and 30% due to spinals which include LA toxicity and high blocks. 50% of cardiac arrests occur during GA and 7% are thought to occur during regionals. The complication rates are still quite high!

A thorough pre-operative evaluation even in the most urgent cases, optimising the patient as best as possible before anaesthesia, high degree of awareness and suspicion, a great deal of flexibility, alternate options when one technique fails and most of all a good understanding between the anaesthetist and obstetrician are keys to the successful management of these patients.

For further reading:

1. Critical Illness in Pregnancy in Critical Care Clinics – October 2004;vol 20:4
2. Issues in Obstetric Anesthesia in Anesthesiology Clinics of North America;March 2003
3. Medical aspects of obstetrics – chapter 95 in International Practice of Anaesthesia –vol2. Cedric Prys Robert, Burnell R Brown, John F Nunn.
4. Management of high-risk parturients –section V in Clinical Anesthesia 5th ed– Paul G Barash, Bruce F Cullen, Robert K Stoelting
5. Complicated Obstetric conditions - chapter 58 in Miller's Anesthesia 2005–Ronald D Miller vol2.