

Management of Anaesthesia in Obstetrics

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Obstetric anaesthesia guidelines

Obstetric anaesthesia is challenging as well as rewarding. Every anaesthetist will have to face the difficult situations like major obstetric haemorrhage, cord prolapse and eclampsia. The involvement of the anaesthetist in the management of these patients immensely contribute to the outcome of these patients.

In Sri Lanka the causes of direct maternal deaths in 2003 were reported as PIH (18%), PPH (16.5%) and sepsis (11%) and heart disease was the main cause for indirect maternal deaths (9.5%).

Therefore we still need to improve the care given for these patients. We also think it is easy to have a guideline based management in the whole country so that every anaesthetist will have a very clear idea about his/ her role in it.

These guidelines are intended to improve the standards of obstetric anaesthesia services in our country in close collaboration with the obstetricians.

Management of post partum haemorrhage, pre eclampsia and eclampsia and heart disease complicating pregnancy are done in detail. Detailed guidelines are also given for spinal anaesthesia and general anaesthesia for cesarean section.

Eclampsia and moderate to severe heart disease should be transferred to the nearest provincial general hospital or tertiary care centre. Anaesthetist will be called to resuscitate and/or transfer these patients.

2 Pain relief in labour.

2.1 Introduction

Most women experience pain during childbirth. The provision of pain relief during this process should be should be available to all women both for humanitarian and physiological reasons.

2.2 Options available in Sri Lanka.

Options Available

- Opioids
- Epidural analgesia /CSE
- Entonox. (not yet available in Sri Lanka)

2.2.1 Opioids

Pethidine

Dose: 1 mg/kg i.m. 4-6 hourly.

Combine with an antiemetic e.g. promethazine (phenergan)
25 mg i.m.

Side effects:

Nausea, vomiting, maternal and foetal respiratory depression. Foetal respiratory depression can occur between 1-3 hours after administration. Therefore avoid intramuscular pethidine if delivery is anticipated during this time interval.

Respiratory depression can be reversed by naloxone (both in mother and newborn). (Dilute 400 mcg naloxone in 9 ml of saline or water and give 1 ml at a time intravenously as required).

2.2.2 Entonox

This is a mixture of 50% nitrous oxide and 50% oxygen which provides effective analgesia when administered by inhalation. It has a rapid onset of action (1-2 minutes) and offset (2-8 minutes). It is available in cylinders (blue with white shoulders) or as a piped gas. It is usually self administered by the patient through a demand valve. Use of the facemask or mouthpiece should be demonstrated to the patient by trained staff. It is important to ensure that the patient starts inhaling the Entonox at the onset of a contraction rather than at the peak, in order to build up adequate circulatory levels of Entonox.

These side effects usually disappear once inhalation of Entonox is stopped and the patient breathes room air.

Side effects

- Nausea
- Dizziness
- Sedation if used for long periods

Entonox should be administered by a trained person with appropriate skill and experience.

Blood pressure monitoring equipment should be available.

Oxygen, resuscitation drugs and equipment (including intubation equipment) should be close at hand.

Requires “one to one” care by a midwife trained to monitor this procedure.

Contraindications: Patient refusal, local or systemic sepsis, coagulation problems, uncorrected hypovolaemia.

Procedure:

- Obtain consent exclude contra indications.
- Establish intravenous access

- Prepare epidural solution: bupivacaine 0.1% with fentanyl 2 mcg/ml
- (To prepare 50 ml of this solution, take 38 ml of normal saline into a 50 ml syringe, add 10 ml of 0.5% plain bupivacaine and 100 mcg i.e. 2 ml of fentanyl).
- Prepare ephedrine for intravenous injection (ephedrine 30 mg diluted in 9 ml of saline or water).
- Test dose: After sitting and securing epidural, give 10 –15 ml of epidural solution after negative aspiration for blood and CSF. This bolus dose also serves as a loading dose and will provide analgesia for 60-90 minutes.
- After each bolus dose check blood pressure every 5 minutes for 20 minutes and every 20-30 minutes thereafter.
- If the blood pressure drops more than 30% of baseline

Management of drop in BP

- Give ephedrine 3 mg intravenously and repeat as required
- Turn patient into lateral position
- Oxygen 3-4 litres/ min by face mask
- Increase iv fluids

Start infusion
epidural solution
6-12 ml/ hour

- For maintenance of analgesia, either

Monitoring

- Pulse
- Blood pressure (see above)
- Level of block (should be between T8-T9)
- Pain score or pain assessment
- Foetal heart

If level of block is greater than T8 stop infusion till level recedes (if infusion is being given)

2.3 Complications

2.3.1 Incomplete block:

Unilateral block: Pull out catheter 1-2 cm, turn patient on to side with no analgesia

Missed segment: Give fentanyl 25-50 mcg epidurally, pull out epidural catheter 1-2 cm.

If the above measures fail the epidural may have to be re-sited.

After delivery the epidural catheter should be removed and the tip inspected to confirm that it is intact.

2.3.2 Post dural puncture headache (PDPH)

Refer section 5.5

A postnatal visit should be done to make sure the patient does not have headache or neurological deficits.

All the above should be documented in the patient's case notes

References

1. Oxford handbook of Anaesthesia (2001)
2. Royal Free Hospital and UCLH guidelines.

3 Fasting in labour

3.1 Introduction-

Stomach takes up to 1000ml before intragastric pressure rises. (8ml -20ml/kg.)

Volume after an overnight fast of more than 8 hours is an average of 20ml.

Gastric emptying is not delayed in pregnancy.

Pain and opioid analgesics can cause an unpredictable delay in gastric emptying in labour.

0.1% Bupivacaine with 2mcg/ml of Fentanyl does not cause delay in emptying.

3.2 Feeding in a uncomplicated patient with low risk for LSCS-

- Any amount of clear fluids could be given during labour. Limit to 50-100 ml at a time.
- Continue H2 receptor blockers and metaclopramide 8hourly during labour.
- If for some reason oral fluids are not given 1-2ml/kg iv fluids in n. saline should be given in addition to the syntocinon infusion.

Fluids that can be given

- Should be- clear
- Iso osmolar
- Non particulate.
- No fizzy drinks.

4.3 High risk for LSCS

4.3 1 Identify the patients

- Past section in labour.
- Twins
- Diabetes complicating pregnancy.
- Pregnancy induced hypertension.
- Heart disease complicating pregnancy.
- (AS, MS, HOCM, AR and MR complicated with pulmonary hypertension.)
- Patients with predicted difficult intubation.
- Morbidly obese.
- History of instrumental delivery.

Fluids available

- Plain
- King
- Lime
- Water
- Ice cubes

g labour.

It and the random blood sugar should be done to prevent hypoglycaemia and hyperglycaemia.

- Do not overly restrict fluids in those with PIH and heart disease.

PIH - 1ml/kg of ringer lactate.
Heart disease - 1-1.5ml/kg.ringer lactae or n saline
Continue - H2 receptor antagonist & Metaclopromide 8 hourly

Reference-

1. NICE guidelines 2002

4 Anaesthesia for Caesarean section.

Caesarean section can be done under regional or general anaesthesia. Most sections are now done under regional anaesthesia due to the advantages and it has been shown that it has reduced the maternal mortality and morbidity. The choice of anaesthetic technique is best made after evaluating the clinical picture and the advice of a senior clinician.

4.1 Regional anaesthesia for Caesarean Section (Grade X)

4.1.1 Advantages:

- The avoidance of the hazards of inhalation of gastric contents and failed intubation during general anaesthesia.
- The elimination of the problem of awareness associated with general anaesthesia.
- The absence of neonatal depression.
- Participation of the mother in the birth.
- A reduction in blood loss.
- Postoperative analgesia may be provided using spinal or epidural opioids.
- Early breast feeding by the mother.

4.1.2 Disadvantages:

Hypotension can occur probably due to aorto-caval occlusion despite the use of left uterine displacement and seemingly adequate preload. Placental blood flow during regional anaesthesia is not reduced provided that hypotension is avoided.

Pain during surgery. This can usually be avoided by ensuring that the block is adequate before starting surgery. Fentanyl either added to a spinal block or an epidural block will improve the quality of the block.

A spinal provides a denser block than an epidural and should require less supplementation during surgery.

Nausea and vomiting during the operation. The incidence of this is often related to hypotension and therefore hypotension should be treated immediately. Nausea immediately following a regional block is an indication to give IV ephedrine before the mother's blood pressure is checked.

- **Do NOT use** ergometrine, which causes nausea
- and vomiting in 40% of cases.
- Use Oxytocin 5 iu administered slow iv.

Time to establish regional block. Often there is insufficient time to perform a regional block when the condition of the mother or the baby is in doubt. In these cases a general anaesthetic is used. If possible attempt to

Advantages of CSE

- The spinal block's speed of onset and density of block combined.
- Ability to administer further doses of local anaesthetic and opioids via the epidural catheter in prolong surgery.
- Administer pain relief post operatively.

- Combined Spinal Epidural (CSE), (single interspace / needle through needle or 2 spaces)

Cesarean Section

4.1.4 Preparation for Regional Anaesthesia:

4.2 Pre-anaesthetic Assessment:

The patient should ideally have a pre-anaesthetic assessment done before coming to theatre.

During this visit-

- The anaesthetist should explain the procedure and the risks involved as given in the anaesthetic chart.
- The patient should be made aware that the regional technique can fail and the possibility of discomfort and or pain during the Caesarean section with the risk of conversion to general anaesthesia.
- Anti acid prophylaxis (see General anaesthesia section please)
- Asses the airway.

Contra indications

- Patient
- Sepsis
- sepsis
- Absen
- Local
- Coag
- Fixed
- Hypo

4.3 Equipment:

Ensure that the following equipment is available before proceeding to gown up etc.

- Spinal needle (25G/ 27G) Grade X
- Epidural set [which contains a 16G epidural needle / catheter / loss of resistance syringe
- Filter / filter needle / drawing up needles Grade Y
- 27G, 119mm long, spinal needle.
- surgical gown, gloves, mask, skin prep, adhesive tape.
- **Check anaesthetic machine, circuits and monitors.**

4.4 Drugs:

Lidocaine for skin infiltration



hyperbaric (heavy) bupivacaine [2 – 2.5 ml of 0.5% bupivacaine

+ Or –

200 to 300 µg morphine (0.2 to 0.3 ml of morphine solution] / **fentanyl** 12.5 µg

- Fentanyl only provides 1-2 hours of postoperative analgesia if given spinally with bupivacaine. Intrathecal morphine provides longer postoperative analgesia than intrathecal fentanyl and is associated with less nausea and vomiting compared with epidural morphine.
- Since morphine is given intrathecally, there is no need to give further epidural morphine at the end of the operation. The epidural catheter is used only for intraoperative supplementation with local anaesthetics.

- If only intrathecal fentanyl is used, give 2-3mg morphine in 10ml of N/Saline via the epidural catheter at the end of the operation for postoperative analgesia.
- **Ephedrine or phneylephrine** (where available) should be available for immediate use to treat hypotension (e.g. 30mg ephedrine diluted in 10ml saline). **Grade X**
- If used phenylephrine, be vigilant and careful when diluting and administering the drug because of the possibility of error in calculation and overdose which could be harmful.
- The concentration of phenylephrine in an ampoule is 10 mg in 1 ml. add this 1ml (10mg) to a 100ml of normal saline to make up a solution that contains 100 µg phenylephrine per ml. Draw up 10 ml of this stock solution into a 10ml syringe and use this to administer 50 to 100 µgm boluses to maintain the maternal blood pressure.
- Antibiotics and oxytocin.
- Drugs necessary for general anaesthesia and emergency drugs should always be prepared before commencing.

Drugs made ready before administering a spinal

- Lignocaine
- Hyper baric bupivacaine
- Morphine or fentanyl
- Ephedrine / phenylephrine
- Oxytocin
- Antibiotics
- Resuscitation drugs available
- Drugs necessary for general anaesthesia

4.5 IV fluids

Insert at least a 18 G cannula.

Commence N. saline or Hartman's solution and send rapidly.(500ml) while spinal anaesthesia is being given.

4.6 Maternal Position:

Most anaesthetists prefer the mother to be either **sitting** or in the **right lateral** position. In either position it is necessary for the mother to flex the lumbar spine to open up the intervertebral spaces.

The SITTING position may be preferable in the obese patient as it can facilitate identification of the midline. But ultimately the position that is acceptable for both the mother and the anaesthetist should be adopted.

4.7 Technique

4.7.1 Single Shot Spinal for Caesarean Section

A pencil point 25/ 27G pencil point spinal needle should be used for a single shot spinal technique.

- IV cannula and monitoring (NIBP, SpO₂)
- Place the patient in the sitting position.
- There are 2 options for the spinal injection

2 - 2.5ml, 0.5% heavy bupivacaine (= 10 - 12.5 mg) + 200 - 300µg morphine

2.5 ml, 0.5% heavy bupivacaine (= 10 - 12.5 mg) + 12.5 µg to 25 µg fentanyl [0.25ml to 0.5ml of standard commercially prepared fentanyl solution / 50µg/ml

- After spinal injection, the patient should then be placed supine with left lateral tilt.
- If the block height is below T4 place the patient head low if needed, if the above manoeuvre fails to spread the local anaesthetic.

- Postoperatively prescribe analgesia.
- Prescribe intramuscular morphine 10 to 15mg ONLY if intrathecal morphine has not been given with the spinal, since this will be needed when the analgesic effect of the spinal fentanyl wears off (approx 90 to 120 minutes).

4.8 Epidural Anaesthesia.

- IV cannula and commence iv fluids
- Monitoring attached- NIBP, SpO₂.
- Site the epidural.
- Place the patient in the supine position with left lateral tilt.
- Draw up 20ml of local anaesthetic (see below).
- Administer a test dose of 3 ml of solution.
- Wait 3 to 5 minutes.
- If no weakness of the legs, give the rest of the LA solution slowly over 2-3 mins. (I.e. 17ml)

4.8.1 Choices of Local Anaesthetic (20ml total volume):

- Bupivacaine 0.5%, 20ml.
- Mixture of Lidocaine 2% (10ml) + Bupivacaine 0.5% (10ml) + 0.1ml of 1 in 1000 epinephrine (final conc = 1 in 200,000 epinephrine)
- 0.5% levobupivacaine. GRADE Z
- Lidocaine 2% (20ml) + 0.1 ml of 1 in 1000 epinephrine / (final conc = 1 in 200,000 epinephrine)

If the block height to touch is below T5, give a further 5 to 10 ml of solution.

4.9 CSE Method:

- Commence an IV infusion.
 - Attach the monitoring equipment.
 - Place the mother in the sitting or right lateral position (if preferred) for the CSE.
 - Site the epidural needle in the L₃₋₄ space using LOR to saline.
1. Remove the inner stillette from within the spinal needle.
 2. There is no need to use it (the spinal needle is a pencil point needle and has a side hole – it cannot be plugged with dural tissue; the stillette does not increase the strength of the spinal needle; once the epidural needle is in place, the spinal needle only has to pass through the epidural space through the duramater into the subarachnoid space.
 3. If the spinal needle is passed slowly, CSF is seen at the hub of the spinal needle in the rare event of not getting a “dural click”; it may also reduce the incidence of paraesthesia by limiting the passage of the spinal needle when no “dural click” is felt. Then pass the spinal needle slowly through the epidural needle into the subarachnoid space. A “pop” or “dural click” is usually felt as the spinal needle pierces the dura.
 4. Immediate flow of CSF is usually seen at the hub of the spinal needle. Do not advance the spinal needle any further. Grip both the hub of the spinal needle and that of the epidural needle so that the spinal needle does not move during injection. Inject the prepared spinal solution e.g. bupivacaine 10 – 12.5 mg + morphine 200 to 300µg. It is not necessary to aspirate prior to or during the spinal injection since the spinal needle may move out of the subarachnoid space.

- Stop injecting immediately if the patient reports pain or discomfort.
- After the spinal injection remove the spinal needle from within the epidural needle.
- Thread the epidural catheter 5 cm into the epidural space and strap to the patient's back using adhesive tape.

4.9.1 Failed subarachnoid placement of needle

- No more than 2 passes of the spinal needle through epidural needle are allowed. Otherwise the risk of spinal headache is increased.
- Pass the epidural catheter into the epidural space (4-5 cm) as normal.
- Position the patient supine with left tilt and maintain this position until surgery is ready to start. Place a urinary catheter once anaesthesia has been established.
- Recent evidence shown that there is no need to give oxygen during elective LSCS but it should be given in emergency LSCS.
- Check motor block and sensory block after 5 minutes. At 10 minutes sensory block should extend to at least T4 (nipples) and almost complete motor block of the legs should also be present (just able to move the toes). If the block is inadequate, give 5-10 ml of 0.5% bupivacaine or 2% lidocaine with 1 in 200,000 epinephrine or a 50:50 mixture of 2% lidocaine & 0.5% bupivacaine.
- The currently accepted level of block required for Caesarean section is from S5 to T3/4.

4.10 Assessment of block

Various techniques can be used

- Ethyl Chloride [EC]
- Ice
- Finger tip

EC- This can be used to assess both cold and touch (by asking for a water drop sensation).

Assessment of the lower limit of the block and degree of motor block should also be performed. Warm, dry feet indicate onset of sympathetic block. The presence of motor block of the lower limbs ensures that the regional anaesthesia may be working but will not guarantee pain free surgery.

Do not start surgery unless there is

- Bilateral sympathetic block [warm, dry feet]
- Bilateral sensory block to cold for at least T4 [nipple line]
- Bilateral touch block to T5 [mandatory]
- Bilateral motor block [Preferably using the Bromage scale]

documented on the anaesthetic chart for both elective and emergency cases.

Pain should not occur during surgery with this technique. However if surgery is prolonged (> 60 min), consider giving an epidural to top up local anaesthetic regardless of whether the mother is comfortable intraoperatively.

4.11 Pain during Caesarean Section

Mothers should always be warned of **intraoperative pain** or **discomfort under regional anaesthesia** as well as the rare **risk of general anaesthesia** if pain cannot be relieved.

Although both epidural and spinal techniques are highly effective for LSCS, pain is much more likely and can be of a greater severity with epidural anaesthesia. Regional anaesthesia may not remove the sensation of pushing or tugging in its entirety, but pain or discomfort should be dealt with promptly

4.11.1 Pain during CS can occur during the following points:

- Skin incision – this indicates an extremely poor level of regional anaesthesia. There is a high risk that general anaesthesia will be needed.

This could be prevented by ensuring adequate block before commencing surgery.

- Peritoneal incision – this occurs prior to the uterine incision. The peritoneum is not closed at the end of the operation.
- Exteriorization of the uterus.
- Traction on the uterosacral ligaments or bladder.
- Swabbing of the paracolic gutters
- Shoulder tip pain – this may be related to blood or amniotic fluid irritating the diaphragm (referred pain from the phrenic nerve, C3-C5).
- Chest pain – rarely this may be accompanied by ECG changes. The cause of this is unknown although small venous air emboli or coronary artery/ esophageal spasm / reflux have been suggested.

4.11.2 Management of pain during LSCS

There are **many options** to treat intraoperative pain during LSCS but these will depend on the stage of the operation and if there is an epidural catheter in place. **Reassurance** at all times to both the mother is **very important**.

If spinal anaesthesia has been used:

Since there is no epidural catheter in situ, the treatment options are limited.

- **IV fentanyl** 25 – 100 µg IV depending on the weight of the patient. Rare but potential for causing respiratory depression particularly if intrathecal opioids have already been given.
- A **50:50 mixture of nitrous oxide and oxygen** given through the anaesthetic machine. If a routine facemask is used then air entrainment will reduce the concentration of nitrous oxide being given to the patient. In such circumstances it is appropriate to use a higher nitrous oxide gas flow than oxygen.

General anaesthesia, if intraoperative pain persists.

This is a nightmare for the anaesthetist and the obstetrician.

Extra help should be called for and an experienced person available to give cricoid pressure.

If epidural anaesthesia has been used:

- Epidural catheter top up with local anaesthetic. This will take approximately 10-15 minutes to work. Opioids can also be given with the local anaesthetic if they have not been given already.

10ml 5% bupivacaine or 2% lignocaine with epinephrine 1 in 200,000 + 50 ~100 µg Fentanyl

- IV fentanyl 25 – 100 µg
- A 50:50 mixture of nitrous oxide and oxygen.
- General anaesthesia.

At which point can surgery temporarily stop?

Surgery should be stopped temporarily until complete analgesia is achieved.

However in the following situations **general anaesthesia** will be the only option if there is severe pain:

- Severe fetal distress
- Major maternal hemorrhage
- Uterus has already been incised

Other causes of discomfort during LSCS:

- Pressure sensation on the abdomen which is usually due to the excessive pressure during delivery of the baby.. Mothers should always be advised of the possible sensation of pressure during the extraction of the baby.
- *Shivering*: Epidural opioids can reduce the incidence of shivering.
- *Nausea and vomiting*: This can be associated with hypotension. Prophylactic measures to prevent maternal hypotension include fluids, ephedrine, and phenylephrine. If the cause is thought to be drug induced, then iv metoclopramide (10 mg) or ondansetron (4-8 mg) can be used if available.(
GRADE Y

4.11.3 Documentation of intraoperative pain

The need for additional analgesia and actions taken should be recorded in the patient's notes.

After the operation, administer 2-3mg epidural morphine in 10 ml saline ONLY if spinal morphine has not been given with the spinal component of CSE. Leave the epidural catheter in place at this point.

If the patient develops breakthrough pain on the labour ward an epidural top up can be given if the catheter is in situ. Transfer to the recovery area.

Diclofenac - Do not administer diclofenac to those allergic to NSAIDs, unstable asthmatics diabetics, in PIH. Postoperative Diclofenac is suitable to give to stable asthmatics with no history of NSAID allergy.

- Oral paracetamol 1gm 6 hourly for 24 hours.
- Regular rectal diclofenac 100mg bd for 2 days or 50 mg tds orally if no contra indication.
- Regular tramadol 50-100mg orally, 8 hourly
- If no sensory or motor block has been achieved repeat the spinal with the same or a lesser dose.
- An anti emetic may be prescribed
- Avoid using any additional opioids. (as it has been given before)

- Remove pillow & continuously reassess the level of block. When adequate level is achieved replace the pillow.
- If surgery has not commenced repeat block. (after 10 minutes)
- Convert to GA

4.12.3 High Spinal

Diagnosed by,

- Patient complains of difficulty in breathing & talk, poor cough & hand grip.
Bradycardia, hypotension

Management

- Reassure the patient
- 100% O₂
- Treat hypotension as above
- If poor cough, restless & poor respiratory effort intubate.
(Midazolam 1 -2 mg/ Suxamethonium 25 -50 mg IV)
Extubate when cough reflex is good.

4.13 Management of pruritus

Opioids used along with local anaesthetics in spinal injection may cause pruritus (itching) in the postoperative period.

The incidence of that can be up to 20% depending upon which opioid was used (morphine or fentanyl). Itching after low dose epidural top-ups is extremely rare.

If itching does occur after the spinal injection:

- **Reassure** mother that the itching can be minimal and if severe enough, treatment will be given immediately.
- If troublesome give **IV naloxone** in boluses of 40µg and wait 5 minutes between boluses. A small dose of naloxone should reverse the pruritus without reversing the analgesic effect.
- Also consider 10mg **IV chlorpheniramine** (Piriton) or 4-8mg **IV of ondansetron** (if available)

4.14 Emergency Caesarean Section

- Emergency Caesarean Section should be performed **under regional block wherever possible**. A **one shot spinal** may be most suitable in experienced hands.
- When no epidural catheter is in situ prior to an emergency LSCS consider siting a CSE which provides greater flexibility than a spinal or an epidural block alone.
- If an epidural has been used for labour analgesia, it should be topped up for surgery:

Management of Pruritus

- Reassure
- Nalaxone iv or
- Chlorpheiramine iv or
- Ondansetrone iv

Drugs as previously described to a total of 20ml

- If an epidural block had been working initially, but when assessed has worn off (mother in pain, no sympathetic block), give 20ml of any one of the above choices as a bolus. This will ensure good spread in the epidural space.
- Do not start surgery unless there is an adequate block (see section on elective LSCS. If the block is inadequate, consider a spinal or GA.
- If severe fetal distress occurs with no epidural in situ, then a spinal anaesthetic or GA should be considered.

The type of anaesthesia should be modified according to the category of the LSCS.

References:

- 1.Cowan C.M, Kendall J.B, Barclay P.M, Wilkes R.G. Comparison of intrathecal fentanyl and diamorphine in addition to bupivacaine for Caesarean section under spinal anaesthesia. BJA 2002; 89: 452-8.
- 2.Hallworth S.P, Fernando R, Bell R, Parry M.G, Lim G.H. Comparison of intrathecal and epidural diamorphine for elective Caesarean section using a combined spinal-epidural technique. BJA 1997; 82: 228-32.
- 3.Fernando R, Jones H.M. Comparison of plain and alkalized local anaesthetic mixtures of lignocaine and bupivacaine for elective extradural Caesarean section. BJA 1991; 67: 699-703.
- 4.Russell I.F. Levels of anaesthesia and intraoperative pain at Caesarean section under regional block. International Journal of Obstetric Anaesthesia; 1995; 4: 71-7.

Grade 1 (Emergency woman or fetus)

Grade 2 (Urgent which is not immediate distress)

Grade 3 (Scheduled maternal or fetal in labour)

Grade 4 (Elective maternity team)

5. Robinson J, Fernando R, Sun Wai Y.W, Reynolds F. Chemical stability of bupivacaine, lidocaine and epinephrine in pH adjusted solutions. *Anaesthesia*; 2000; 55: 835-8.

6. Cogliano MS, Graham AC, Clark VA. Supplementary oxygen administration for elective Caesarean section under spinal anaesthesia. *Anaesthesia* 2002; 57(1): 66-9

7. Lucas DN, Yentis SM, Kinsella SM, et al. Urgency of Caesarean section: a new classification. *J R Soc Med* 2000; **93**: 346-50

8. Royal Free Hospital Guidelines –A special thank you to Dr Roshan Fernando for sharing his work.

4.15 General Anaesthesia for LSCS

Caesarean section is a major operation. Patients should be informed of the risks of general anaesthesia during the pre-operative visit. Consent should be obtained for general anaesthesia, oxygenation and cricoid pressure should be maintained. If general anaesthesia is available.

Problems with General anaesthesia

- Difficult intubation
- Aspiration
- Hypoxia
- Awareness

For routine elective LSCS (under GA or regional block) cross match a unit of blood. Where a delay is inappropriate (e.g. severe fetal distress or prolapsed cord), blood must be sent off prior to surgery and an emergency group and save or cross-match requested as indicated

4.16 Antacid prophylaxis

Elective patients should have 2 doses of oral ranitidine 150mg, approx 8 hours apart, plus 30 ml of 0.3M Na Citrate prior to induction. Metoclopramide 10mg should also be given with the second dose of ranitidine.

Emergency patients should have 30 ml of 0.3M Na Citrate only.

Intravenous ranitidine 50mg and iv metoclopramide 10mg is also be given at this time, but is NOT a priority since it has minimal effect on the contents of the stomach at the time of inducing anaesthesia.

4.17 Induction:

The anaesthetic machine, circuits and monitors should be checked before commencing anaesthesia.

- Patients should be transferred to theatre in the left lateral position.
- Confirm that Na Citrate has been given.
- Establish a free-running intravenous line. A 14G cannula is preferred, but a 16G cannula is acceptable.
- Position the mother supine on the table with a 15-degree left lateral tilt as the surgeons start to scrub.
- Pre-oxygenate the patient using 100% oxygen via a close-fitting mask using a Bain circuit/ circle, ensuring sufficient flow to prevent rebreathing. Pre-oxygenate for 3 full minutes.
- Attach the ECG, NIBP, and pulse oximeter probe during this period. Make sure that the end-tidal CO₂ is switched on and connected to the anaesthetic circuit
- When the surgeon is ready, instruct the anaesthetic assistant to be ready to apply cricoid pressure. Ensure that the cricoid pressure is correctly placed and that the mother's head is in the optimal intubating position.

- Administer a rapid bolus of at least 5-6 mg / kg of thiopentone, followed by 1.5 mg / kg of suxamethonium once the eyelids start to droop.
- Do not intubate until the mother fully relaxed. Inflate the cuff immediately after intubation. Ensure that the ETT is correctly placed by observing the end-tidal CO₂ trace and by listening to breathe sounds etc and release the cricoid pressure.
- Give atracurium 0.5 mg / kg.
- Correct FiO₂ during GA for LSCS is still controversial, therefore give 50% O₂: 50% N₂O, with halothane 0.5%/ isoflurane to achieve a MAC of 1.5 prior to delivery of the fetus.
- [Remember the possibility of awareness at all times, and do not hesitate to increase the volatile agent if needed. The effect upon uterine contractility of 15 min exposure to 1.5 MAC of Halothane is minimal, and is rapidly reversed when the volatile agent is discontinued.]
- In the event of severe fetal distress, 100% O₂ may be beneficial to the fetus, but ensure that you use an increased conc. of volatile agent initially.
- Maintenance and Recovery:
- Immediately after the delivery of the baby, give Syntocinon 5 IU intravenously.
- **Do not use ergometrine unless there is marked uterine hypotonia. Do NOT use ergometrine in pre-eclampsia.** (Ergometrine has unwanted effects on the CVS and the GI tract).
- After the cord has been clamped, give a dose of opioid (e.g. morphine 0.1mg/kg pethidine 1mg/kg iv). Alternatively, if an epidural is in situ, top-up with local anaesthetic and epidural opioid.
- Switch to 30% O₂ and 70% N₂O and maintain the volatile agent until the end of surgery.
- At the end of surgery give 100mg diclofenac rectally if it is not contraindicated. Prescribe postoperative analgesia

as with Caesarean section under regional anaesthesia but add morphine 0.1mg/kg or pethidine 1mg/kg 4- hourly, if no epidural opioid has been given.

- The patient should be extubated awake.
- She must remain in the recovery area breathing 4 litres / min of oxygen. A trained nurse should continuously monitor till the mother is awake and able to maintain her airway.
- Monitor NIBP / SpO₂ / ECG to increase the safety of the postoperative period after a GA.
- Ensure analgesia, fluids and anti-emetics are written up prior to transfer to the ward.

4.18 Anaesthesia for other Operative Procedures

Apart from Caesarean section, you may be asked to provide anaesthesia for the following procedures:

- Suturing of third degree tears
- Delivery of retained placenta (MROP) / A spinal dose of 12.5 to 15 mg bupivacaine (also consider adding 25 µg fentanyl to this dose) may be needed to provide adequate conditions (block to T6) for manual removal of a placenta [MROP].
- If an epidural catheter has been in situ for labour this can also be used for MROP - use 15 ml of LSCS mixture.
- Evacuation of retained products of conception
- High forceps delivery / trial of forceps
- Postpartum sterilisation (LRT)
- Laparotomy for repair of ruptured uterus

Regard every patient from 20 weeks of pregnancy until 24 hours postpartum as having a full stomach, and treat accordingly. All patients should have Na citrate premedication (+ H₂ antagonists if time permits), and a rapid sequence induction for a GA.

Perform all the above in the theatre (full monitoring) rather than in the delivery room. An exception may be made for a retained placenta with an effective epidural in situ.

CSE, spinal or epidural anaesthesia is often preferable, except in the case of laparotomy, especially if an epidural is already in situ.

REMEMBER:

- Patients are often hypovolaemic - so ensure good fluid resuscitation and availability of blood before performing block.
- For any intrauterine procedure, particularly retained placenta, a block up to T6 is usually needed to prevent pain.

(Although the effects of hormones are lost 6 hours post partum it is best to intubate the patient for 24 hours. Even if it is more than 24 hours consider intubation if other risk factors are present- obesity, gastro-oesophageal reflux, critically ill or bleeding patient.)

5. MAJOR OBSTETRIC HAEMORRHAGE

5.1 Introduction

Importance

Accurate measurement of blood loss is not possible and visual estimation is highly inaccurate. Under estimation will delay active steps being taken to prevent further bleeding. Therefore resuscitation should be commenced soon after assessing the patient clinically.

5.2 Definition:

Haemorrhage is also defined as more than 500 ml blood loss in a normal vaginal delivery as or more than 1000 ml blood loss in a caesarean section. The effect of the blood loss will mainly depend on the patients previous health status and Hb. Therefore even a lesser amount of blood loss will decompensate her.

5.3 Causes

5.3.1 Antepartum

- Ectopic pregnancy
- Abortion
- H mole
- Placenta Praevia
- Placental Abruption

5.3.2 Intrapartum and Postpartum

- Placenta Praevia
- Previous caesarian section with placenta praevia
- Placental Abruption
- Placenta Accreta
- Uterine Rupture
- Uterine Atony

- Over distended uterus
- Retained products of conception
- Genital tract injury
- Broad ligament tear

5.3.3 Associated with coagulation failure

- Abruptio placentae
- Coagulopathy associated with pre eclampsia and HELLP syndrome
- Septicaemia / Intrauterine sepsis
- Retained dead foetus
- Amniotic fluid embolism
- Incompatible blood transfusion
- Existing coagulation abnormalities

5.4 Key activities

These four should be done simultaneously

<ul style="list-style-type: none"> • Communicate • Resuscitate • Monitor • Arrest bleeding
--

5.4.1 Communication

- Call consultant anaesthetist or experienced staff
 - Registrar, SR in anaesthesia.
 - Senior MO in anaesthesia
- Inform theatre staff Senior
- Call theatre transport team – needs to be developed
- Alert blood bank
- Registrar / Haematologist
- Organize blood warmer / rapid transfuser.

Transfer the patient to OT / place where adequate space, light, monitoring and resuscitation equipment are available.

In theatre:

- Assign one person to record vital signs, fluids & drugs.
- Monitor conscious level, degree of pallor, heart rate, blood pressure, urine output per hour (urinometer), SPO₂, FHR.

Tachycardia and oliguria are signs of hypovolaemia (PIH patients treated with beta blockers may not exhibit the tachycardic response)

5.4.2 Resuscitation

According to ABC

A- Airway

- Assess the airway
- Administer O₂ 15L/ min
- If unconscious triple maneouere to open the airway and intubate (RSI with cricoid pressure) as soon as possible.

B – Breathing.

- If no breathing may need intubation and respiratory support.
- Position the mother on the (L) lateral tilt (intra-partum).

C – Circulation.

- At least 2 peripheral lines will be needed. Insert 2 large bore cannulae (not less than 14 G).
- External jugular or cephalic vein will give a higher flow.
- If decision is made to put a central line it must not interfere with resuscitation.
- Take at least 20 ml of the patient blood for
 - blood grouping/cross matching
 - full blood count
 - Coagulation studies. (APTT/INR/PT, fibrinogen levels)

- random blood sugar
- blood urea
- Order a minimum of 6 units of blood, 6 units of FFP reserve PRP and Cryoprecipitate and or whole blood if available.
- Start resuscitation with warm crystalloids or colloids till blood is available. If crystalloids are given 3X estimated blood loss should be given.
- Aim of fluid management should be to give all the losses within the 1st hour and continue to replace the ongoing losses and maintenance.
- Fluids can be given using pressure bags.
- A 3 way tap could be put at the end of the cannula and blood/fluids can be given rapidly.
- It is best to limit colloids to 15ml/kg/24 hours of hetastarch and 50ml/kg/24 hours of tetra starch.
- Blood transfusion should be commenced as soon as cross matched blood is available.
- 2 units of un-cross matched group specific blood or O negative blood can be given in life threatening situations.

5.4.3 Transfusion of blood and blood products

While blood is gushing out it is a waste to give coagulation factors and platelets. Once bleeding is controlled by surgical intervention more blood as required and blood products can be given.

Once surgical haemostasis has been more or less achieved continued oozing may be due to clotting factor deficiencies.

Indications for transfusion of FFP

- If blood loss exceeds half the patients blood volume. Give 2 units of FFP
- or FFP 10 – 15 ml / kg.
- If coagulation or oozing from puncture sites, infuse FFP 10 – 15 ml / kg
- If PT> 1.5 times normal, INR > 2 or APTT > 2

Indications for platelet transfusion

- Give platelets according to the haematologist's report or after platelet count testing.

Indications for platelet transfusion

- If platelets count is less than 50,000 or decreasing trend platelets 1 unit/10 kg should be given
- If platelet count is between 50, 000 and 100, 000 but there is a potential for platelet dysfunction (eg .Pre eclampsia)
- Continuous bleeding and oozing in spite of blood, FFP and Cryoprecipitate

Indications for transfusion of cryoprecipitate

- When the fibrinogen concentration is < 80mg/ dl
- In the presence of excessive micro vascular bleeding with a fibrinogen concentration of 100 – 150 mg/ dl
- Continuous bleeding and oozing in spite of blood and FFP
- Patients with known Von Willibrand's disease and Haemophilia A if factor viii is not available

- Indications for transfusion of cryoprecipitate
If refractory haemorrhage not responding to FFP, platelets and cryoprecipitate, recombinant activated factor VII, iv bolus 90 micro grams /kg x 2 doses.
Antifibrinolytics – aprotinin, thromboxane
Repeat investigations at least every 4 hours until patient is stabilized.

5.4.4 Monitoring

1. Clinically

- Cardio Vascular System
 - Pulse Rate, rhythm, volume
 - BP Aim for at least a SBP of 90mm Hg. Direct arterial blood pressure monitoring when facilities are available.
 - Capillary perfusion time <2 seconds.
- Respiratory System
 - Respiratory rate -Aim for a rate <30/min
 - Lung bases Look for fine crepitations of fluid overload
 - SpO₂.
 - ABG PaO₂, PaCO₂, BE.
- Renal System- Aim for a UOP >0.5ml/kg/hour.
- Temperature- should be above 37 °C

2. Investigations-

a. Haematological

- Hb%, PCV – Aim >8 g/dl
- Platelets > 50,000.
- Coagulation studies.
 - APPT/ PT/INR
 - Fibrinogen
 - Thrombin time.

b. Bio chemical -Serum electrolytes, blood urea.

Patient is best nursed post operatively in HDU or ICU for 24-48 hours as necessary.

Repeat investigations at least every 4 hours until patient is stabilized.

Monitoring should be continued.

(ECG, NIBP, SPO2, UOP per hour, FBC, coagulation, SE, ABG, CVP, arterial line if unstable, body temperature)

Monitoring	
• Clinical	
• Investigations	-biochemical, haematological
• Equipment	- non invasive, invasive.

5.4.5 Arrest of bleeding

Medical management - to ensure uterine contraction

- Oxytocin bolus 5 IU / infusion, 20 IU in 200 ml, 50ml/ hour.
- Ergometrine 500 µg IM / 250 – 500 µg IV
- Carboprost (PGI2) 250 µg IM or intramyometrial

Surgical management -Depends on the cause

5.4.6 Anaesthesia for Obstetric Haemorrhage

Resuscitation and surgery should be done simultaneously. Senior help needed in theater. (Consultant anaesthetist, senior medical officers)

It is ideal to have a systolic BP at least more than 80mm Hg before commencing general anaesthesia. But in life saving emergencies GA may be needed to be given even if this cannot be archived.

- General anaesthesia with rapid sequence induction is indicated for patients who are shocked with coagulopathy and active bleeding.
- Ketamine 50 – 75 mg, etomidate, TPS 50 mg or a combination of Midazolam 1-2 mg and Fentanyl 50-100 ug can be given for induction followed by suxamethonium.100mg iv.
- Maintenance with 50% O2 N2O.
- Inhalational agents relax the uterus. Use cautiously.
- Regional anaesthesia maybe indicated for cardiovascular stable patients with normal coagulation.
- Incremental doses of fentanyl or morphine should be used during surgery.
- With improvement of blood pressure midazolam 1-2mg iv or 0.5% inhalational agents could be used.
- Long acting muscle relaxants given as required.
- IV fluids continued.
- Reversal at end of surgery.

5.4.7 Postoperative Care

It is best to manage the patient in a HDU/ICU.

Indication for
<ul style="list-style-type: none"> • Oliguric patient • Cardiovascularly unstable patient • Patients with coagulation failure. • Respiratory distress – persistent hypoxia of SpO2 <94% with O2 therapy. • Pre-existing medical conditions co-exist.

Women at high risk for PPH should be delivered in centers with facilities for blood transfusion & ICU. Early planning with obstetric and anaesthetic teams is crucial.

Do not hesitate to involve surgical colleagues as required.

6 Pregnancy Induced Hypertension and Eclampsia

6.1 Introduction

It is a multi system disease of the pregnant woman affecting cardiovascular, central nervous systems, liver, kidneys and coagulation. Management should involve the obstetrician, paediatrician, the anaesthetist and the haematologist.

6.2 Diagnosis

6.2.1 Mild PIH

- Systolic BP > 130 mmHg or Diastolic BP > 90 mmHg
- Proteinuria 1+ (> 300mg /day)
- With or without oedema.

6.2.2 Severe Pre eclampsia

- Systolic BP > 160 mmHg or Diastolic BP > 110 mmHg
- Proteinuria 2+ or 3+ (3gms/day)
- With or without oedema
- Visual disturbances
- Epigastric pain, nausea and vomiting
- Coagulopathy
- Decreased UOP
- HELLP
- Decreased foetal movements will be seen.

6.3 Assessment

6.3.1 Clinical

- General - Jaundice, petechiae, bruising, oozing from puncture sites, bleeding gums.
- CVS - pulse BP DBP > 90 mmHg.
- RS - lung bases for crepts.
- CNS- headache, nausea, vomiting, blurring of vision. Reflexes- knee jerks- 2+ - 3+, clonus >1
- Generalized fits, level of consciousness
- Optic fundi –papilloedema, haemorrhages.
- Liver -liver tenderness.
- Renal -UOP – 0.5ml/kg/hr. (100ml/4hours)
- Urine for albumin.

6.3.2 Investigations

All investigations should be done whether it is mild or severe PIH. If there is severe PIH the investigations must be done.

- FBC **Hb%, PCV- (normal PCV= Hb%x3, if PCV> expected shows intra vascular dehydration.) Platelets -<50,000 consider transfusion.**
150,000 repeat at least daily. Best 2/day.
- Coagulation screen –
BT - normal 4-6 mts.
CT - normal 5-10 mts.
APTT, PT/INR (If facilities are available)
- Blood urea, serum electrolytes.
- Serum Creatinine
- Liver function tests (SGPT (AST), serum bilirubin)
- Grouping & cross-match.

6.4 Principles of management

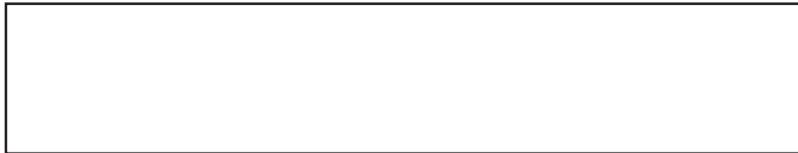
Principles of management

- Treatment of hypertension
- Correction of hydration.
- Prevention of eclampsia.
- Delivery of foetus.

6.4.1 Treatment of Hypertension

- **Severe hypertension**

If Systolic BP > 170 mmHg or Diastolic BP > 110mmHg
(MAP >125mm Hg)



**Aim is to reduce
MAP 125mmHg**

- A rapid fall in maternal BP as a result of IV anti hypertensives can cause fetal heart rate abnormalities especially in the growth retarded fetuses.
- Monitor FHS with continuous CTG during administration of IV antihypertensive.

Drugs

1. Hydralazine IV

- bolus- 5mg IV at 20 min intervals upto a maximum dose of 20mg
- infusion - 20 mg in 100ml n. saline – burette set
- 20mg in 50ml n. saline – syringe pump
- Given at a rate of 2- 10mg/hr - titrate aiming for a DBP of <100mm Hg.

2. Labetalol IV

- Could be started if no response to hydralazine or heart rate >120/min.
Bolus- 20mg IV slowly, repeat after 10-20 min to a max dose of 200mg.
Infusion- 200mg/100ml N. Saline 20 mg/hr double the dose at a time to a maximum of 160mg/hr.

3. Nifedipine SR 20mg oral should be commenced.

- Sublingual nifedipine should be avoided as drastic BP could occur causing foetal distress and the drop in BP is transient.

4. Mild PIH

- Nifedipine SR - 20mg bd to a maximum 80mg daily.
- Methyl dopa -Loading dose 500 – 750mg Continue with 250mg 8 hourly to a maximum of 1g 8 hourly
- Labetalol oral 100mg bd maximum dose of 800mg daily.

6.4.2 Correction of hydration

- Correct hydration with clear fluids orally or with iv Hartmann's n. saline. Fluid bolus of 200ml over 20-30 minutes could be used. If the patient is oedematous colloids are better than crystalloids.
- Maintenance - crystalloid infusion 1-1.5 ml/kg/hour
- or if UOP < 0.5ml/kg/hour is previous hr + 30ml

- Selective colloid expansion can be considered prior to pharmacological vasodilatation.
- If UOP <0.5ml/kg/hour for more than 2 hours give colloids 50ml or 100ml crystalloids over 20minutes. Repeat 3 boluses. If no improvement CVP guided fluid therapy indicated.
- frusamide can be given when the UOP is low (<0.5ml/hr for few hours) in the presence of adequate hydration OR when there is pulmonary oedema only.

6.4.3 Prevention and treatment of eclampsia

6.4.3.1 Indication for MgSO₄ therapy

6.4.3.2 Method of administration.

Loading dose – 4g IV diluted in 200ml N.saline over 10 – 15 min.(could be diluted in 50ml and given with a syringe pump)

Maintenance – 1g /hr – 3gm/hour.

Titrated to archive a normal patellar reflex.

Insert a wide bore cannula and should be given in a ‘piggy back’ technique as MgSO₄ cause severe irritation.

40% MgSO₄ –10ml

50% MgSO₄ – 8ml

1.1.1 Indications

- Severe PIH
- Eclampsia

6.4.3.3 Monitoring-

The following should be monitored-

- patellar reflex
- UOP >.0.5ml/hr.(accept 25ml/hr, or 100ml/3 hours)
- RR>14/min,
- heart rate (bradycardia could occur)
- ECG done before commencement and daily as MgSO₄ can cause shorten QT interval.

MgSO₄ levels- GRADE Y

	MgSO ₄ levels	
Normal	0.8-1.1	
Therapeutic	2.0-4.0	
	5.0-	Loss of patella reflex, weakness, nausea, feeling of warmth, flushing, somnolence, double vision, slurred speech
	6.5-	Muscle paralysis, respiratory arrest.
	>12.0	Cardiac arrest.

6.4.3.4 Management of MgSO₄ toxicity

- Reduce /stop rate of maintenance
 - loss of patellar reflex
 - low UOP <0.5ml/kg/hour for 2 hours
 - RR <10/min
 - Heart rate <50/min
 - Short QT interval.

- hydrate patient with fluids.
- Frusemide iv should be avoided as MgSO₄ is solely excreted by the kidneys.
- If seizures continue or if seizures recur 2nd bolus of MgSO₄ can be given at 2- 4g at 5 – 10 min. Before the 2nd dose blood sample for serum MgSO₄ if facilities are available.
- Continue the MgSO₄ infusion at the previous dose.
- If the patient develops severe bradycardia or cardiac arrest during MgSO₄ therapy 10% 10ml of calcium gluconate should be given immediately. (Suspect MgSO₄ toxicity until proven otherwise.) **GRADE X**

Hydrate the patient
Reduce the infusion rate of MgSO₄
Ca gluconate iv

6.4.4 Delivery of the foetus

A multidisciplinary approach involving obstetrician, anaesthetist and the paediatrician.

Hysterotomy, normal vaginal delivery or Caesarean section can be performed.

6.4.4.1 Anaesthetic management

For vaginal delivery pain relief should be provided, refer guideline on pain relief in labor.

- **Regional Anaesthesia**

Spinal, combined spinal epidural, epidural are not contraindicated.

Contraindications for regional anaesthesia

- Platelet count < 80x10³
- Elevated APTT or TT (prolonged BT and CT)
- Refusal by the mother
- Sepsis at the site.
- Clinical evidence of coagulopathy.

- **General anaesthesia**

Must inform the Consultant Anaesthetist or seek senior anaesthetist help.



1.1.1 Problems in GA with severe PIH

- Administration of GA
- Exaggeration of intubation response leading to a CVA, MI
 - Difficult intubation
 - Aspiration.
- **Pre induction**
 - Control BP with hydralazine iv.
 - Make sure there is a well running iv line.
 - Anta acid prophylaxis.

Obtund intubation response.

Fentanyl 2mcg/kg iv (best is alfentanyl 1mg iv)
MgSO₄ 40mg/kg over 5-10 minutes before induction
Lignocaine 2% 1-2 mg/kg
All these drugs should be given 5-10 minutes before induction

- Induction – Rapid sequence induction
- Maintenance- O₂ : N₂O/ air, inhalation agent
- Muscle relaxants- non-depolarizing muscle relaxant as required.
- Analgesics- opioids
- IV fluids- 1-1.5ml/kg/hour
- **Syntocinon – 5 IU bolus at delivery. Slow IV or infusion. Avoid ergometrine.**
- Syntocinon 20 IU added to 200ml of Hartmann's solution 50ml/hour infusion could be commenced.
- Reversal.

6.4.4.2 Post operative management

To ward /HDU/ICU accordingly.

- Continue monitoring
- Repeat investigations as indicated.
- Maintain fluid balance.
- Anti hypertensives and MgSO₄ therapy should be continued. MgSO₄ is continued for 24 hours after the last fit or 24 hours after the commencement of therapy. If it is continued for a longer duration MgSO₄ level should be monitored.
- Pain relief – paracetamol, parenteral opioids or epidural analgesia

NSAIDS contra indicated in immediate post operative period until coagulopathy is excluded.

Consider transfer to ICU

- Seizures
- MAP > 125mmHg despite Hydralazine/Labetalol therapy
- Persistent oliguria with normal/high CVP
- Pulmonary oedema with oliguria
- Compromised myocardial function with vasodilators required

1. Why Mothers Die 1997-1999 The Confidential Enquiries into Maternal Deaths in the United Kingdom: RCOG press 2001

2. Douglas KA, Redmond CWG. Eclampsia in the United Kingdom. *BMJ* 1994;309:1395-1400

3. Redman CWG. Chapter 6 Hypertension. In: *Medical Disorders in Obstetric Practice 4th Edition*. Ed: Michael de Swiet. Pub: Blackwell 2002

4. Isler CM, Barrilleaux PS, Magann EF, Bass JD, Martin JN Jr. A prospective, randomized trial comparing the efficacy of dexamethasone and betamethasone for the treatment of antepartum HELLP (hemolysis, elevated liver enzymes, and low platelet count) syndrome. *Am J Obstet Gynecol* 2001 Jun;184(7):1332-7; discussion 1337-9

5. The Magpie Trial Collaborative Group. Do women with pre-eclampsia, and their babies, benefit from magnesium sulphate? The Magpie Trial: a randomised placebo-controlled trial. *Lancet* 2002;359:1877-1890

6 Hood D.D, Curry R. Spinal versus epidural anaesthesia for Caesarean section in severely preeclamptic patients, a retrospective survey. *Anaesthesiology* 1999; 90: 1276-82.

7 Management Of Heart Disease in Pregnancy

7.1 Introduction

Management in pregnancy should be multidisciplinary with the obstetrician, cardiologist and anaesthesiologist in consultation. An accurate diagnosis as to valve involved, severity of lesion and functional impairment has to be made.

Optimisation and monitoring should be carried out not only during pregnancy and labour but also in the puerperium

7.1.1 Heart disease in pregnancy can be classified as :

- Valvular heart disease with fixed cardiac output states- aortic stenosis, mitral stenosis, HOCM and other cardiomyopathies, pulmonary stenosis.
These patients are very high risk and best delivered in a tertiary care centre.
- Regurgitant valve disease- mitral, aortic, tricuspid regurgitation, mitral valve prolapse.
- Congenital heart disease.
ASD, VAD, PDA with left to right shunt.
- Eisenmenger's disease.
Reversed shunts (right to left shunt)
– High risk needing delivery at a tertiary care unit with ICU facilities.

Summary of Heart Diseases in pregnancy

- Valvular heart disease- fixed cardiac output
Regurgitation
- Congenital heart disease.
Eisenmenger's disease.

7.2 Pre operative assessment

7.2.1 History should be obtained as for a normal patient.

Special emphasis should be stressed on

Signs and symptoms of heart failure.

Shortness of breath. - NYHS classification.

- | | | |
|-----------|---|--------------------------------------|
| Class I | - | No symptoms with ordinary activity |
| Class II | - | Comfortable at rest or mild exercise |
| Class III | - | Comfortable only at rest |
| Class IV | - | Symptoms occurring even at rest. |

Chest pain, palpitations, orthopnoea, paroxysmal nocturnal dyspnoea, fainting attacks.

Drug therapy-

Regular antibiotics, anti coagulants, digoxine, diuretics and K⁺ supplements.

Adequate follow up at cardiology clinic or medical clinic.

7.2.2 Refer to physician/cardiologist in the following:

- a loud fourth heart sound
- any diastolic murmur
- a systolic murmur grade 3/6 or more
- fixed splitting of second heart sound
- opening snap - as the above necessitates
- an echocardiogram

7.2.3 Investigations

- Hb% PCV. Hb kept >9gm/dl
- Serum electrolytes (K+)
- Blood urea/ creatinine.
- PT/INR, APPT
- ECG
- ECHO

7.3 High risk factors to be considered are:

- Prior cardiac events eg. heart failure, transient ischaemic attacks, stroke
- Prior arrhythmias eg. symptomatic brady/tachyarrhythmias NYHA > Class I
- Cyanosis
Valvular or outflow obstruction eg aortic area <1.5 cm², mitral area < 2cm²
- Myocardial dysfunction eg. Ejection Fraction < 40%
Consider valve replacement, PTMC, in the second trimester in severe stenosis and severe symptomatic disease.
After pre operative assessment those who need transfer should be considered.

Patients who will need to be transferred to a Tertiary care Unit-

- Best inform VOG, Consultant Anaesthetist as ICU care may be needed.
- Fixed cardiac output states. (AS,MS, PS, HOCM)
- Patients with complications such as pulmonary hypertension, right heart failure. NYHS 111/1V.

Patients who will need to be transferred to a Base Hospital from a PU

- Any patient diagnosed of a heart lesion.
- Any patient with signs and symptoms suggesting of a heart lesion.

LRT recommended for

Therefore counseling of these patients are essential.

- Fixed cardiac output states. (AS, MS, PS, HOCM)
- Eisenmenger's syndrome.

7.4 Valvular Heart Disease

7.4.1 Mitral Stenosis

- If progressive pulmonary hypertension, right heart failure and low cardiac output are present, consider termination of pregnancy in consultation with the obstetrician and cardiologist.
- NYHA Class III/IV and presence of atrial fibrillation are also high risks.
- Atrial fibrillation should be treated with cardioversion if it is of recent onset (<48 hours), ß blockers, digoxin.

Management at delivery-

- Consider epidural with a block up to T8 to T10 for vaginal delivery, with fluid and vasopressor therapy titrated against blood pressure.
- In NYHA Class III/IV, elective Caesarean section is advisable and a general anaesthetic or a controlled epidural can be used.
- Spinal anaesthesia is contra indicated.
- Epidural or Combined Spinal Epidural can be considered in
- NYHA Class I/II.
- Avoid tachycardia, hypovolaemia, systemic vasodilatation.
- Treat hypotension with phenylephrine 50 mcg/ephedrine 3mg iv.
- Bolus oxytocin contraindicated in view of systemic hypotension and pulmonary hypertension.
- Post op IPPV briefly may be required.

7.4.2 Mitral Regurgitation

Management at delivery-

- Prior to labour manage symptoms with diuretics/vasodilators .
- Regional anaesthesia tolerated well. (spinal epidural and general anaesthesia can be given.)
- NYHA Class III/IV - General anaesthesia may be a better option.

7.4.3 Aortic Stenosis

Management at delivery-

- Elective LSCS advisable, general anaesthesia being the best option with invasive haemodynamic monitoring.
- Spinal anaesthesia is contraindicated.
- Avoid tachycardia, hypovolaemia, systemic vasodilatation
- Phenylephrine to maintain systemic blood pressure.
- Avoid boluses of oxytocin.- oxytocin infusion if necessary

7.4.4 Aortic Regurgitation

Management at delivery-

- Epidural anaesthesia best option. Spinal anaesthesia can be given.
- Avoid hypertension, bradycardia.

7.4.5 Pulmonary Stenosis

Management at delivery-

- Vaginal delivery recommended as operative delivery carries high mortality.
- Controlled Epidural is the best option.
- Spinal anaesthesia in severe pulmonary stenosis is contraindicated.
- Avoid fluid overload, hypothermia, hypercarbia, hypoxia, acidosis, high airway pressure, aortocaval compression

7.4.6 Mitral Valve Prolapse

Choice of anaesthetic does not influence outcome.

7.4.7 Mixed valve disease

Patient should be treated taking **the predominant valve lesion into consideration.**

7.5 Congenital Heart Disease

7.5.1 ASD, VSD, PDA with left to right shunt

- General anaesthesia and regionals can be given.
- Maintain blood pressure. Good hydration to decrease polycythaemia.
- Avoid hypoxia (use high FIO₂), hypercarbia, hypothermia, acidosis, high airway pressure, to prevent reversal of shunt.
- If shunt reverses – 100% oxygen, compress femoral arteries, fluid boluses, vasoconstriction.
- Meticulous attention to remove air from intravenous lines

Treat arrhythmias

Complete heart block - Pace.

SVT with hypotension - Synchronised cardioversion. Amiodarone 300 mg over 1 hour Repeat once.

VT - Adenosine iv
- DC shock, Amiodarone 150mg over 10 minutes.

Eisenmenger's

Very high risk, therefore early termination of pregnancy should be considered.

If patient presents late, elective LSCS should be carried out.

General anaesthesia is the best option.
Spinal anaesthesia contraindicated.
Maintain BP with low doses of systemic vasoconstrictors eg. ephedrine.

7.5.2 Pulmonary Hypertension (primary, secondary)

Very high risk with high mortality and morbidity.

Plan delivery for 32 to 34 weeks.

Vaginal delivery under epidural recommended.

- General anaesthesia better option for LSCS.
- Avoid hypothermia, acidosis, hypoxia, hypercarbia, high airway pressure, sympathomimetics
- High risk period between 2 to 9 days post partum.

7.6 Preparation of the patient for anaesthesia-

- Good assessment of the patient and explaining the procedure to the patient.(HDU/ICU admission)
- Decide wheatear the patient could be done in the hospital or need to transfer to a tertiary care unit.
- Adequate fasting.- Refer safe anaesthesia for ASA I and ASA II
- Anti acid prophylaxis - Refer 5.6 guide line.
- SABE prophylaxis – refer safe anaesthesia for ASA I and ASA II
- Archive correct INR/APTT.

7.7 Mode of anaesthesia

7.7.1 Monitoring

- CVS- pulse, BP, capillary perfusion
intra arterial BP, CVP ABG as necessary.
- RS lung bases SpO₂
- Renal UOP at least 0.5ml.kg/hour

7.7.2 Options available

- | |
|--|
| <ul style="list-style-type: none">• General anaesthesia• Regional- spinal, controlled epidural, epidural. |
|--|

General anaesthesia

- Induction - Rapid sequence induction obtund intubation response. Refer guide line 7
- Maintenance- O₂/ air (best avoid N₂O if air is available.) minimal use of inhalational agents. (halothane 0.5 MAC isoflurane 1 MAC)
- Opioids – after delivery of foetus. Can be used liberally. (morphine 0.1mg/kg i.v.)
- Frusemide 20-40mg iv at delivery of the foetus
- Syntocinon bolus avoided. Infusion can be used as necessary
- Add 20IU of syntocinon to 200ml 0.9% saline 50ml/ hour.
- Avoid ergometrine.
- IV fluids- 1ml/kg/hour

Post op

- Admit patients with fixed cardiac output state and those on heart failure therapy to ICU for monitoring for 48 hours.
- O₂ therapy for 48 hours.
- Post op- Hb%, ECG, serum K⁺
- DVT prophylaxis.

