Anaesthetic management of the pregnant patient for non-obstetric surgery

Target audience	Primary and secondary care incuding general surgery, gynaecology, urology, anaesthetics, intensive care, orthopaedics, theatres, midwives and obstetricians.
Patient group	Pregnant women.

Summary

Each year the incidence of non-obstetric surgery in the pregnant patient is approximately 1-2%. Operations performed may be directly related to the pregnancy, (such as interventions for cervical incompetence), indirectly related to the pregnancy (such as ovarian cystectomy) or unrelated to the pregnancy (such as appendicectomy, cholecystectomy or trauma operations). The main risks for any procedure are fetal loss or preterm birth secondary to either the underling disease process or the operation itself.

Good anaesthetic practice aims to provide safe anaesthesia for the mother whilst minimising risk to the unborn fetus.

This guideline will provide suggestions on patients positionin as well as the pharmacological, surgical, obstetric and anaesthetic considerations pre-, intra- and post-operaive periods.

The overall aims for the anaesthetist are to:

- Preserve the mother's life.
- Maintain normal maternal physiology.
- Maintain uteroplacental blood flow and oxygen delivery.
- Avoid teratogenic effects of drugs.
- Avoid stimulating the myometrium.

Pre-operative considerations

Timing of surgery

- Elective surgery should be postponed until after delivery.
- Semi-elective surgery, which cannot be deferred, should be delayed until the 2nd trimester where possible.
- Urgent, necessary surgery should not be delayed, regardless of trimester, as any delay may have a detrimental effect on both the pregnant women and fetus.

Communication

- With the team - a consultant anaesthetist should be informed and close liaison is required between the anaesthetist, obstetrician and surgeon.
- With the patient: patient should be counselled on risks.
    - Risks to the pregnancy are thought to be related to either the operation or the patients underlying condition e.g. sepsis, rather than the anaesthetic itself. Intra-abdominal surgery carries the highest risk.
    - Large outcome studies[3] show non-obstetric surgery is associated with one extra:
        - Caesarean birth for every 25 operations
        - Preterm birth for every 31 operations
        - Low birth weight baby for every 39 operations
        - Prolonged inpatient stay for every 50 operations
        - Stillbirth for every 287 operations

Fetal monitoring

- Up to the limit of viability e.g. 22 weeks of gestation, the foetal heartbeat (FH) should be detected using doppler before and after the procedure, where maternal condition allows.
- Between 22-23 weeks of gestation, discussion is necessary, including the pregnant woman, consultant obstetrician and consultant neonatologist.
- If the fetus is at a viable gestational age e.g. 22 weeks of gestation and above, cardiotocography (CTG) monitoring should be used before and after the procedure, where maternal condition allows.
- Intraoperative CTG monitoring may be appropriate when certain criteria are met:
    - Monitoring is physically possible during surgery
    - Viable gestational age
    - Informed maternal consent
    - Neonatal services available
    - Presence of an obstetric team both to monitor the CTG and perform an emergency caesarean birth should fetal distress occur

Patient location and positioning

- **Planned** surgery from 24 weeks of getation should **ideally** be undertaken at the Wishaw site where immediate access to obstetric and neonatal facilities is available.
- **Emergency** surgery should be undertaken at the site most suitable to preserve the mother's life at any gestation of pregnancy. Secondary consideration should be given to the fetus once viability is reached and transfer to Wishaw considered pre-operatively only if safe to do so. Communication with the on-call consultant obstetrician is vital in this regard.
- If the patient is on the Wishaw site, they may be kept in a surgical or obstetric ward pre-operatively depending on initial presentation and location most appropriate for maternal management. FH/CTG monitoring can be performed by midwives in both locations.
- If the patient is unwell and bed-bound, an upright position or a left lateral tilt should be adopted from 20 weeks of gestation onwards.

Premedication

- Patients should be fully fasted if possible.
- Omeprazole 20mg (or ranitidine 150mg) and 30ml 0.3M sodium citrate should be given to all patients from 14 weeks of gestation unless contraindicated.
- Consideration should be given to the administration of corticosteroids 24-48hrs prior to surgery for patients with fetuses at viable and premature gestational ages. This should be discussed with the consultant obstetrician.

Thromboprophylaxis

- RCOG (Royal College of Obstetricians and Gynaecologists) guidelines puts patients undergoing surgery in an intermediate risk category for venous thromboembolism (VTE), meaning that patients should be prescribed low molecular-weight heparin (LMWH) if it is not contraindicated.
- Unless contraindicated all patients should have thrombo-embolic deterrent stockings (TEDS) applied.
- Care should be taken around the timing of doses of LMWH if regional anaesthesia is to be performed.

Intra-operative considerations

Due to alteration in the maternal anatomy and physiology secondary to pregnancy, some alterations to standard anaesthetic practice is indicated.

Positioning

- From 18-20 weeks of gestation, all patients should be placed on a 15 degree left lateral tilt to avoid aortocaval compression.

Regional anaesthesia

- This is preferred as it avoids the hazards of general anaesthesia associated with the pregnant patient (hypoxia, acid reflux, difficult intubation, foetal drug exposure).
- The main risks are related to hypotension and decreased placental blood flow – this may be counteracted with intravenous fluids and phenylephrine (20-50 microgram boluses), with ephedrine (3-6milligram boluses) as a second-line vasopressor.
- Dose of local anaesthetic for spinal/epidural may need to be reduced due to the mechanical effects of an enlarging uterus.
- Supplementary oxygen may be required due to the increased risk of hypoxaemia secondary to a decreased functional residual capacity and an increased oxygen demand.

General anaesthesia

- Rapid sequence induction with careful pre-oxygenation (at least 3 minutes recommended), cricoid pressure and rapidly acting muscle relaxant should be performed in all patients from 16 weeks of gestation.
- A head-up tilt may be beneficial to increase functional residual capacity and reduce the risk of gastro-oesophageal reflux.
- Increased airway oedema and vascularisation may make intubation more difficult, a smaller ETT (endotracheal tube) may be required e.g size 7.0 ETT.
- Maintain normal respiratory alkalosis of pregnancy (3.7 – 4.3 kPa) when mechanically ventilating.
- Mechanical ventilation in pregnancy generally follows the same strategies as in non-pregnant patients apart from an increased minute ventilation to accommodate the physiologic respiratory alkalosis of pregnancy by increasing the ventilatory frequency while maintaining a similar tidal volume (if not, sufficient higher tidal volumes is allowed with airways pressure plateau up to 35 cm H_2O). Profound hypoventilation and maternal hypercarbia can lead to acidosis and myocardial depression in the fetus. Similarly, hyperventilation and maternal hypocarbia can cause uteroplacental vasoconstriction and fetal hypoxia.
- Avoid hypoxia and hypotension.

Thromboprophylaxis

- Intermittent calf compression devices should be used for all patients intra-operatively.

Drug considerations

The most vulnerable period is between the 15th and 56th day of gestation, when structural abnormalities can occur, thereafter functional changes are more common.

The principle of drug choice in these patients is to choose agents with a good track record of use in pregnancy. However it is reassuring that no anaesthetic agents at usual clinical doses have been shown to be teratogenic. There is no proof of efficacy for prophylactic tocolytics.

Drugs to avoid

- Ketamine – due to increasing uterine tone and therefore risk of miscarriage
- Nitrous oxide – especially in first trimester due to its inhibition of methionine synthetase and therefore potential impairment of deoxyribonucleic acid (DNA) production
- Benzodiazepines – single doses are considered safe.
- NSAIDS (non-steroidal anti-inflammatory drugs) – associated with premature ductus arteriosus closure and persistent pulmonary hypertension from 30 weeks of gestation and may be associated with miscarriage when used in early pregnancy. May be considered for short term use for 2-3 days in 2nd trimester. Some patients may already be on low dose aspirin which should be continued. Paracetamol and opiates are considered safe.

Drug dose alterations required

- Miminum alveolar concentration of volatile agents is reduced from 8-12 weeks. Volatile agents increase uterine blood flow and decrease uterine tone in pregnancy.
- Reduced doses of local anaesthetic (LA) are required for similar dermatomal spread for central neuraxial blocks. Reduced protein binding increases the risk of LA toxicity.
- Physiological changes of pregnancy increase the fraction of unbound local anaesthetic because of decreased alpha$_1$ acid glycoprotein concentrations, increase drug uptake because of venous engorgement and increased cardiac irritability from altered oestradiol and progesterone levels. Hypotension from neuraxial anaesthesia may lead to reduced uteroplacental perfusion, as perfusion of the uterus is pressure dependent without autoregulation. Coloading with i.v. fluids and giving a prophylactic vasopressor, such as phenylephrine, at the time of neuraxial block placement can significantly reduce the incidence of hypotension. Regional Anaesthesia may limit any potential adverse effects on neurodevelopment.
- Reduction in plasma cholinesterase activity can prolong the effects of suxamethonium

Safety of laparoscopy

Laparoscopy confers similar benefits in pregnant as is non-pregnant patients and is considered safe, provided that:

- Uterine size should be determined by palpation or ultrasound. The port insertion site should be adjusted according to fundal height. The procedure should be performed by an experienced laparoscopist.

- Pneumoperitenum should be gradual and current evidence supports operating intraabdominal pressures of 12mmHg (15 or less).
- Capnography is used for intra-operative CO_2 (carbon dioxide) monitoring
- Uterine blood flow should be maintained by avoiding maternal hypotension and hypo/hypercapnia (maternal end tidal CO2 of 3.7-4.3kPa)
- Neostygmine and atropine is suggested for reversal of neuromuscular block during pregnancy (fetal bradycardia when neostigmine was given in combination with glycopyrrolate).

Post-operative considerations

- Postoperative analgesia is particularly important in pregnancy, as poorly-controlled pain is associated with preterm contractions and preterm birth. Regional anaesthetic techniques, acetaminophen and local anaesthetic wound infiltration should be considered and used if appropriate. Long-term use of NSAID's is generally avoided in pregnancy because of increased miscarriage risk early in pregnancy and premature closure of the ductus arteriosus later in pregnancy.
- Patients should be managed in recovery until usual discharge criteria are met.
- Patients should be returned to an appropriate surgical ward for post-operative care.
- Fetal monitoring should be performed as appropriate for gestational age.
- If there are concerns regarding fetal well-being or threatened premature labour/miscarriage, these should be discussed with the on-call obstetric registrar (phone 5754) or consultant (phone 5753), and the maternity unit co-ordinator (7890).
- All patients should continue to wear TEDS until fully ambulant and LMWH should be prescribed where indicated

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