

Laparoscopic Surgery

Intraperitoneal insufflation with gas (CO₂, air, etc.) for minimally invasive surgery.

ANESTHETIC CONSIDERATIONS:

- Effects of pneumoperitoneum
- Effects of CO₂ insufflation
- Trocar insertion misadventures
- Patient positioning considerations
 - Trendelenburg vs reverse Trendelenburg
- Contraindications
 - Inability to tolerate general anesthesia
 - Moderate to severe pHTN
 - Increased ICP
 - Severe CHF
 - Significant intraabdominal adhesions
 - Uncorrected hypovolemia (e.g. sepsis)

ANESTHETIC GOALS:

- Maintain hemodynamics while anticipating CV changes associated with procedure
- Be aware of possibility to convert to open procedure

HISTORY / PHYSICAL

- Routine history and physical
- Specific attention should be placed on discovering contraindications to laparoscopic surgery

INVESTIGATIONS

- None specific to procedure
- Tailor investigations to rule out diagnoses that would contraindicate a laparoscopic procedure
 - ECG
 - PFTs/spirometry
 - ABG
 - CXR
 - Echo

OPTIMIZATION

- Optimization of cardiorespiratory function is important prior to proceeding with procedure

ANESTHETIC OPTIONS

- (All techniques below have been used successfully but local and regional have limitations)
- None
- Local
- Regional
 - Epidural or spinal may be used but not commonly
 - Requires sensory T4-5 block height for surgical laparoscopy
 - Diaphragmatic irritation may still be present and incompletely alleviated with regional techniques
- GA
 - Most will require GA with oral ETT to minimize aspiration, PPV with potentially increased pressures required with intraperitoneal insufflation, and the requirement for neuromuscular blockade for most procedures, etc.
 - Consider possibility of converting to open procedure
 - Consider gasless technique (abdominal wall lifters are used for exposure)
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ANESTHETIC SETUP

- Routine setup
- Doppler and ETCO₂ are the current standard of care for detecting air embolism

MANAGEMENT OF ANESTHESIA

- **Induction**
- **Maintenance**
 - Likely require neuromuscular blockade to facilitate surgical exposure and PPV
 - Any maintenance technique ok as long as it achieves the goals for the case
 - Use of nitrous controversial but most suggest its avoidance as it may cause bowel distention impairing surgical view, etc.
- **Emergence**
 - Awake, alert, strong, warm, comfortable and protecting airway
 - Consider PCA unless convert to open which may then consider epidural or other techniques

DISPOSITION & MONITORING

- Laparoscopic procedures result in decreased post-op pain and hospital stay
 - Also, decreased post-op pulmonary dysfunction
 - PONV may be higher

PREGNANCY

- 3 main concerns
 - Uterine or fetal trauma
 - Fetal acidosis from absorbed CO₂
 - Decreased maternal CO and uteroplacental perfusion
- Most believe that potential benefits of a laparoscopic approach outweigh risks compared to an open approach

- Shorter hospitalization
- Less post-op pain
- Decreased thromboembolic and wound complications
- Faster return to normal activities
- Clinical studies suggest that the fetal effects of CO₂ pneumoperitoneum and increased intra-abdominal pressure are limited
- Careful surgical and anesthetic techniques are critical
- GAs used in the vast majority
 - Case reports of epidurals used
 - RSI with ETT intubation and PPV to maintain ETCO₂ 32-36mmHg
 - Anesthesia maintained with NDMB, opioid and a volatile
 - Avoid N₂O to prevent bowel distention
- As with any semi-urgent procedure during pregnancy, 2nd trimester is preferable
 - However, for emergency cases, laparoscopic surgery can be performed during any trimester
 - Of course, elective cases are deferred until after baby born
- As with conventional surgery, fetal well-being is best preserved by keeping maternal oxygenation, acid-base status, and hemodynamic parameters within normal pregnancy limits
- Other suggestions
 - Intermittent lower extremity pneumatic compression stockings
 - Fetal HR and uterine tone should be assessed pre- and post-op
 - Left uterine displacement
 - An open (Hassan) technique is preferred, but a Veress needle, or an optical trocar may be used
 - Low pneumoperitoneum pressures (10-15 mm Hg) should be used
 - Tocolytic agents should not be used prophylactically but considered when evidence of preterm labour is present

PATHOPHYSIOLOGY/ COMPLICATIONS

Effects of pneumoperitoneum

- CVS
 - Initial increase in preload followed by a decrease
 - Increased MAP, SVR, PVR, PCWP, CVP, +/- HR (normal to slightly increased)
 - Decreased CI
- Respiratory
 - Increased airway pressures (peaks and means), PCO₂
 - Decreased FRC, VC and compliance
 - PaO₂ normal to decreased
- Potential subcutaneous emphysema, PTX, etc.

Effects of CO₂ insufflation

- Hypercarbia
 - Myocardial depression
 - Tachycardia
 - Acidosis
 - Increased PVR!
- Venous CO₂ embolism
 - If significant enough, thought to cause air lock in the RV resulting in a dramatic decrease in CO and very low ETCO₂ tracing, +/- cardiac arrest (PEA, etc.)