Laparoscopy in Pregnancy

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1 Introduction

Laparoscopy has recently become popular, and indications for its use are expanding daily. Some of the reasons for its widespread use include its minimally invasive nature, reduced postoperative pain, and morbidity for the patient, earlier return of gastrointestinal function and earlier ambulation of the patient [1–3].

Traditionally, pregnancy was considered a contraindication for laparoscopic procedures. A major concern was the altered physiology of pregnancy which reduces maternal cardiopulmonary reserve [4]. Therefore, when pneumoperitoneum is induced with carbon dioxide (CO_2) in pregnant women for laparoscopy, it may rapidly equilibrate with the blood levels by diffusion from peritoneal surfaces leading to acid-base imbalance with hypercarbia and respiratory acidosis. Also, in the second and third trimester of pregnancy, the pneumoperitoneum along with the gravid uterus can exert substantial pressure on the inferior vena cava. This can impair venous return, consequently reduce cardiac output and increase the risk for venous thromboembolism. The enlarging uterus is also at risk of injury during entry at laparoscopy from either the Veress needle or the Trocar [5, 6].

Laparoscopy during pregnancy can potentially lead to adverse foetal outcomes [7]. Teratogenic effects from drug exposure when laparoscopy is performed in the first trimester, foetal acidosis from maternal acidosis, thermal effects of energy sources used in operative laparoscopy, CO_2 insufflation of the myometrium with the Veress needle and preterm delivery are some of the complications that have been associated with laparoscopy during pregnancy [8–10].

2 Current Perspectives on Laparoscopy in Pregnancy

Recently, there has been increasing evidence that diagnostic and operative laparoscopy can be safely performed during pregnancy. A recent sys-

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tematic review of published literature revealed that laparoscopy has been safely conducted in the first, second and third trimesters of pregnancy [11]. Some of the laparoscopic procedures that have been performed in pregnancy include adnexal surgery for adnexal torsion, ectopic pregnancy, accidental ovarian cysts, appendectomy and cholecystectomy. These conditions usually present with abdominal pain in pregnancy often as emergencies.

It is however noteworthy that majority of the published works on laparoscopy during pregnancy are retrospective case series with low-grade evidence. They, however, suggest that despite initial concerns, laparoscopic procedures can be successfully carried out in pregnancy with comparable risk as open surgery for the mother and foetus. Retrospective studies and case series may represent some selection bias as procedures that resulted in adverse outcomes may less likely be reported. There is a need for well-designed randomised clinical trials on the safety and feasibility of performing laparoscopic procedures during pregnancy as a routine.

The experience of the surgical team, clinical state of the patient and available equipment are still important factors to be considered when planning for a laparoscopic procedure for the pregnant patient in order to ensure god outcomes. Importantly, for resource-limited settings such as sub-Saharan Africa, the cost implications of laparoscopic procedures for the pregnant women need to be considered when making decision between open and laparoscopic procedures.

3 Indications for Laparoscopy During Pregnancy

- Sepsis (acute appendicitis, ovarian abscess)
- Biliary tract disease such as symptomatic gallstones
- Benign adnexal mass accidents such as torsion, large hydrosalpinx, rupture or haemorrhage into ovarian cysts
- Symptomatic fibroid (pedunculated, broad ligament)
- Heterotrophic pregnancy (tubal, rudimentary horn, ovarian)
- Suspected ovarian malignancy detected in pregnancy
- Laparoscopic abdominal cervical cerclage for history of repeatedly failed vaginal procedure

4 Some Contraindications for Laparoscopy During Pregnancy

- Lack of patient consent
- Lack of requisite skill and equipment
- Poor cardiopulmonary reserve
- Extensive abdominopelvic adhesions
- Shock
- Obesity

5 Relevant Investigations (Abdominal Pain in Pregnancy)

A blood work-up that includes a full blood count, electrolytes and urea with serum creatinine may be required. In addition, chest X-ray and electrocardiogram may be necessary before exposure to general anaesthesia required for laparoscopic procedures.

In terms of imaging, ultrasound imaging is most commonly used. It excludes differential diagnosis and helps in assessing foetal viability, well-being and pregnancy dating. MRI, where available, may also be a useful investigation. The CT scan has limitations for use in pregnancy because of radiation exposure and adverse effects of contrast that may be used.

- Haematological profile
- Chest X-ray
- Electrocardiogram
- Ultrasound scan
- MRI
- CT scan (rarely justified)

6 Valid Consent for Laparoscopy in Pregnancy

Consent may be considered not fully informed and therefore not valid if it did not include consequences to mother and child. After 20 weeks of cyesis, it is good practice to get an experienced neonatal doctor to talk to the patient about possible associated risks of severe prematurity and foetal demise.

7 Procedure for Laparoscopy in Pregnancy

To safely conduct laparoscopy during pregnancy, some precautionary measures and modifications from conventional techniques in laparoscopy for the non-pregnant woman have been described.

Lung maturity: If time allows, consideration should be given to improving foetal lung maturity with a course of two betamethasone or dexamethasone injections 12–24 h apart. It is also prudent to ensure neonatal ITU bed is available, in case preterm labour is triggered by surgery

Anaesthesia: General anaesthesia with endotracheal intubation remains the technique of choice for laparoscopy during pregnancy. In the first trimester of pregnancy, careful selection of drugs to avoid known teratogenic agents is important. In late pregnancy, impaired venous return from compression of the inferior vena cava arising from pressure of the gravid uterus and effects of pneumoperitoneum can be minimised by applying the lateral decubitus positioning of the patient and minimising the degree of reverse Trendelenburg tilt on the operating table.

The measurement of end-tidal CO_2 concentration in the endotracheal tubes by capnography to ensure it remains between the physiological ranges of 25–30 mm can help prevent hypercarbia and respiratory acidosis. If a rise in end-tidal CO_2 is detected, CO_2 elimination via the alveoli can be increased using controlled hyperventilation.

Surgical anatomy: In terms of technique for gaining access to the peritoneal cavity, an open Hasson technique appears safer than a closed percutaneous puncture using the Veress needle during the second and third trimesters of pregnancy. Insufflation using the sub-xiphoidal point and right or left mid-clavicular points 1–2 cm below the coastal margins have also been successfully described in pregnancy [1, 12].

The overall principle guiding placement of the primary port trocar placement is that it should be at least 6 cm above the palpated height of the uterine fundus. The placement of the secondary and other ancillary ports is determined by the planned surgical procedure and the stage of the pregnancy (Fig. 1).

Following insufflation, the intra-abdominal pressure should be maintained as low as possible, usually below 15 mmHg, while allowing adequate visualisation during the procedure. This helps reduce the pressure from pneumoperitoneum on the inferior vena cava and the gravid uterus.

Foetal consideration: Continuous monitoring of the foetus is recommended when laparoscopy

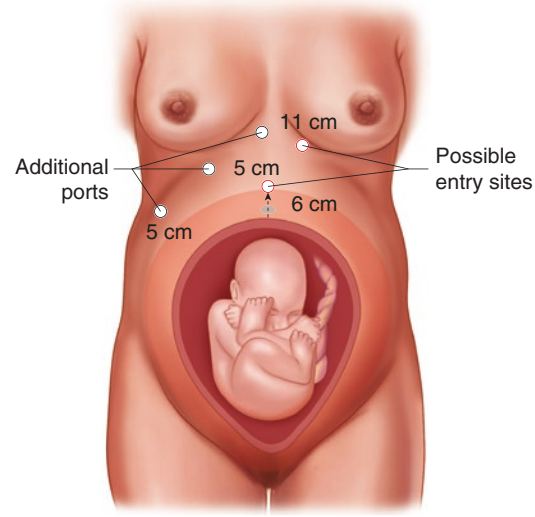

Fig. 1 Sites for placement of trocar port during laparoscopy in pregnancy

is being performed during pregnancy for a viable foetus. This is to enable the early detection of significant foetal compromise during the procedure for appropriate intervention. The use of prophylactic tocolysis during the procedure has been suggested as a strategy to avoid preterm labour and delivery. The long-term effects of foetal acidosis arising from maternal respiratory acidosis during laparoscopic procedure in pregnancy have not yet been determined. Evidence suggests that preoperative and postoperative foetal monitoring suffices and does not support routine intraoperative tocolysis [13, 14].

8 Postoperative Considerations

Thromboprophylaxis is advised after laparoscopy in pregnancy especially where the surgical time was prolonged [15]. This could be done using pneumatic compression devices on the lower limbs of pregnant women undergoing laparoscopic procedures or pharmacologically with unfractionated or low-molecular-weight heparin. Other maternal complications that have been reported include wound infection, abdominal or pelvic abscess formation, intestinal ileus and haemorrhage [16].

Preterm delivery, foetal loss and injury to the gravid uterus have been documented [9, 17]. The monitoring of the foetal heart for abnormalities and the uterus for contractions should continue for at least 24 h after the procedure. Tocolysis should be administered when there is a high risk of, or evidence of, preterm labour [1, 13, 14].

9 Conclusion

Diagnostic and operative laparoscopy has increasingly become popular in contemporary surgical practice. Its advantages and benefits have made it an attractive option for performing surgical procedures during pregnancy. The physiological and anatomical changes associated with pregnancy present peculiar risks when laparoscopy is to be performed in pregnancy. An understanding of these changes is important in others to implement appropriate measures to prevent adverse outcomes and complications when laparoscopy is to be performed in pregnancy.

Learning Points

- Laparoscopic procedures are increasingly becoming more available and accessible.
- Previously, the anatomic and physiologic changes in pregnancy made pregnancy to be considered a contraindication for laparoscopic procedures.
- Recent advances in our understanding of the physiological changes in pregnancy, equipment for laparoscopy and surgical competence have made laparoscopy during pregnancy safer.
- Laparoscopic procedures such as adnexal surgery for adnexal torsion, ectopic pregnancy, accidental ovarian cysts, appendectomy and cholecystectomy have been safely performed in the first, second and third trimesters of pregnancy.
- Maternal complications from laparoscopy during pregnancy may include thromboembolic phenomenon, wound infection, intestinal ileus and haemorrhage.
- Foetal complications may include preterm delivery, foetal heart abnormalities and foetal loss.
- There is still a need for high-quality research evidence to explore the role, safety and efficacy of laparoscopic surgery during pregnancy compared to open surgery.

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