FETAL RISK DURING LAPAROSCOPIC SURGERY IN PREGNANCY

DR. MAHER SALEH AL ABBADI
CONSULTANT OBSTETRICIAN AND GYNECOLOGIST
KING ABDULAZIZ SPECIALTY HOSPITAL, KINGDOM OF SAUDI ARABIA
MEMBER WORLD ASSOCIATION OF LAPAROSCOPIC SURGEON

Dr. K. MISHRA, M.MAS; MRCS
SENIOR CONSULTANT LAPAROSCOPIC SURGEON
DIRECTOR, LAPAROSCOPY HOSPITAL, NEW DELHI
MEMBER WORLD ASSOCIATION OF LAPAROSCOPIC SURGEON
MEMBER INDIAN ASSOCIATION OF GASTROINTESTINAL ENDOSURGEONS
MEMBER SOCIETY OF AMERICAN GASTROINTESTINAL AND ENDOSCOPIC SURGEONS

ABSTRACT:

Aim: To evaluate the indications, efficacy of laparoscopic surgery during pregnancy and the associated potential fetal risks.

Material and Method: A literature search was performed using Medline and the search engine Google. Criteria for selection of literature were methods of analysis (statistical or non statistical), operative procedure (only universally accepted procedures were selected) and the institution where the study was done (Specialized institution for laparoscopic surgery).

Keywords: laparoscopy, pregnancy, fetus, appendectomy, cholecystectomy, adnexa.

Conclusion: Laparoscopic surgery for abdominal disorders during pregnancy make big challenge to the surgeon, the severity of the primary underlying pathology, not the surgery, appear to have the most important factor determining fetal and maternal outcome.

INTRODUCTION:

The known advantages of laparoscopic surgery have make it to be used for various indications. The experience of surgeons and gynecologists is gaining more year after year; this led to use this procedure even during pregnancy for different intra-abdominal disorders. But the fetal and maternal wellbeing require special consideration.

Intra-abdominal diseases requiring surgical intervention during pregnancy present unique challenges to the diagnosis and management [1]. This difficulty in diagnosis and management because of the changes in physiology and abdominal anatomy characteristic of pregnancy. Also these changes make laparoscopic surgery technically more difficult, the obstetrician must determine the status of pregnancy, such as gestational age, viability and inform the patient about the risks related to pregnancy and surgery itself [2,3].

The most frequent intra-abdominal disorders encountered during pregnancy are; acute appendicitis, gallbladder diseases, bowel obstruction and perforation, persistent ovarian cysts, twisted adnexal masses and other pathologies [2,3,4] maternal abdominal disorders and its laparoscopic operative management are associated with fetal loss rate 2-24% according to the recent literature[8,9].

Several mechanisms have been proposed for increased fetal morbidity and mortality associated with laparoscopic surgery during pregnancy, including direct uterine trauma, fetal trauma, intraamniotic CO2 insufflation, trauma to maternal abdominal organs and vessels, decreased uterine blood flow and
oxygen delivery, teratogenic effects of anesthetic drugs, fetal acidosis due to CO2 pneumoperitoneum, adverse effects of anesthesia on maternal hemodynamic and acid-base balance, increased risk of thromboembolic disease, the effect of underlying abdominal pathology, manipulation during surgery and effects of postoperative medications [2,4,7,10,11,12,14,15,16,25].

MATERNAL ORGANS INJURY

In pregnancy, extreme care must be exercised when placing the insufflation needle and canullas to avoid injury to the uterus, as perforation could result in ruptured membranes, bleeding, infection or gas embolism, such complications can easily be avoided by choosing an appropriate entry site Veress needle and trocars. Many authors have advice to place the first trocar just below the xiphisternum and place the supraumbilical trocars under direct vision or to use an optical trocar which allows the surgeon to see the tissue planes and the intra-abdominal organs as the trocar advanced. Some surgeons complied with the open technique for the port placement to create pneumoperitoneum with no bowel or uterine injury. The most life threatening laparoscopic complications are those to large retroperitoneal blood vessels (aorta, ivc, iliac vessels). To avoid these injuries early recognition and prompt treatment is critical. Stomach and bowel injuries from needle or trocar have reported, large number of these injuries may go unrecognized, because of the ability of the stomach and intestines to heal small injuries. Undetected bowel injury is a major factor of postoperative mortality, such patients usually present late in sepsis and peritonitis that could lead to fetal, maternal morbidity and mortality [7, 11, 12, 35, 36].

EFFECT OF CO2 PNEUMOPERITONEUM

While laparoscopic surgery is gaining clinical acceptance for a wide spectrum of intra-abdominal surgical disorders, the CO2 pneumoperitoneum on the fetus has limited the application of laparoscopy in pregnant patient, limited animal studies suggest that pneumoperitoneum may induce fetal acidosis and tachycardia, but this short term acidosis, even if severe, may not lead to deleterious effects. Hunter et al reported fetal respiratory acidosis during CO2 pneumoperitoneum in a pregnant ewe model. Fetal hemodynamic abnormalities (tachycardia and hypertension) were noted and were attributed to fetal hypercarbia; the later was reversed by maintaining mild maternal respiratory alkalosis. Monitoring maternal arterial blood gasses has proven superior to maternal capnography in this regard [23, 24]. fetal acidosis is known to occur with CO2 pneumoperitoneum although the short and long term effects of this unknown. Should the mother become acidemic, the pneumoperitoneum should be released and the patient hyperventilated to expel the CO2 gas before continuing the procedure. It is important to remember that the fetus is more acidemic than the mother[8,9,20,21,22]

CO2 pneumoperitoneum can produce significant alteration in maternal and fetal blood gases, but this transient effect remain unclear. Other studies confirm the lack of intra-abdominal CO2 pressure under 15mmHg on fetal, placental perfusion and blood gases [11,12,13,14].

EFFECT OF INCREASED INTRA-ABDOMINAL PRESSURE

Intra-abdominal pressure has to kept to minimum while maintaining adequate visualization not more than12mm Hg, higher insufflation pressures increase in intra-abdominal pressure and affect cardiac and respiratory physiology [11]. Some authors prefer the use of gasless laparoscopy and the results are good, but the technique has a higher conversion rate than conventional laparoscopy, other surgeons advice to use open / Hasson method for access as a safest technique during pregnancy [2,5,6,7].

Below 15mmHg intra-abdominal pressure is not only to prevent ventilatory and circulatory complications, but also to prevent the risk of gas embolism, which is a lethal complication for both the mother and the fetus, adequate exposure is still possible with less pneumoperitoneum, and does not prevent laparoscopic surgery [18,19,20,21,22,23].
Since pneumoperitoneum enhances lower extremity venous stasis already present in the gravid patient and since pregnancy induces a hypercoagulable state, pneumatic compression devices must be used, in addition to faster postoperative recovery and early mobilization probably reduce the risk of thromboembolic complications [6, 19, and 22]

**EFFECT OF ANESTHESIA AND ANESTHETIC DRUGS**

A part from CO2, anesthetic drugs administered during first trimester of pregnancy may cause abnormalities during the period of organogenesis, such objections are contradicted by a Swedish registry study for the years 1973-1983 covering 720,000 pregnant women, of these 5405 underwent surgery, mainly diagnostic laparoscopy 34%. According to this study, it appears that general surgery in pregnancy causes no increase in stillbirths or birth defects and results in no difference in time or type of delivery, compared with controls, but leads to increased infant mortality and lower birth weight. These authors concluded that the causes are related more to the mothers illness that required surgical treatment than to surgery or anesthesia [2,13,18].

In a recent study published in journal of American society of anesthesiologist 2004, the authors concluded that CO2 pneumoperitoneum produces respiratory acidosis, but does not decrease fetal oxygenation, in contrast the findings indicate that in the preterm fetus, insufflation induced hypercapnia and acidosis are accompanied by prolonged fetal hypoxia and cardiovascular depression. This result suggests that additional work should be conducted to confirm the presumed safety of doing laparoscopic procedures during the second trimester [12, 13, 20, and 23].

The available animal data suggest that caution should be used when considering laparoscopic surgery in pregnant women, and additional clinical and laboratory investigation may be indicated to evaluate fetal risk associated with such surgery [18,26].

**FETAL TRAUMA DURING LAPAROSCOPY**

According to the recent findings, hemodynamic changes during laparoscopic surgery in pregnancy are similar to those in non-pregnant state, the procedure appears to be safe and reduces hospital admissions and stay and frequency of preterm labor. The safest time to perform laparoscopic surgery in pregnancy is second trimester. However it can be complicated by injury of the enlarged gravid uterus and pregnancy loss, in one report the author concluded that inadvertent introduction of the Veress needle into the gravid uterus with subsequent pneumoamnion represents a catastrophic complication of midtrimester laparoscopic surgery and ended by fetal loss[17,19,25]

Brendan C in his study points that the rate of nonobstetric abdominal surgery during pregnancy was 1 in every 527 births. Among the 77 patients the indication for surgery were; adnexal mass 42%; acute appendicitis 21% ; gallbladder diseases 17% and others 21%, there was no maternal or fetal loss. Preterm labor occurred in 26% of the second trimester, and 82% of the third trimester patients. Preterm labor was most common in patients with appendicitis and after adnexal surgery. His conclusion indicates that surgery during first and second trimester is not associated with significant preterm labor, fetal loss and risk of teratogenicity. Surgery during the third trimester is associated with preterm labor, but not fetal loss [2, 7].

**UTERINE BLOOD FLOW**

Decreased uterine blood flow from pneumoperitoneum remains hypothetical. It is reasoned that this is unlikely to be a major concern given the frequent pressure alternations induced during valsalva, coughing, and straining [39], further, it is maintained that pneumoperitoneum may well be safer than manual uterine retraction during open appendectomy and cholecystectomy [40].

**LONG-TERM FETAL EFFECT**
Regarding fetal long term consequences of laparoscopic surgery during pregnancy, one study shows that successful laparoscopic surgery was performed in 10 cases, with one conversion to an open procedure. Intraoperative and postoperative fetal monitoring was performed for at least 24 hours. No fetal distress or demise occurred, nor were any tocolytics used. The resultant children were then monitored with follow-up of 1 to 8 years, and no evidence of developmental or physical abnormalities was detected during study period. The authors concluded that laparoscopic surgery is now proving to be as safe as open surgery in pregnancy. In their study, the long term follow up has no deleterious effects to either mothers or children [27].

Despite recent advances in anesthetic, perinatal, perioperative care, surgical intervention during pregnancy may still result in fetal loss from either spontaneous abortion (especially in the first trimester) or preterm labor (especially in third trimester). Additionally, there is an increased of low birth weight infants, preterm labor and growth restricted babies with surgical intervention during pregnancy. Therefore, when ever possible, surgery should be deferred until after delivery. Unfortunately, urgent surgical intervention in the gravid patient is occasionally necessary. The most common situations encountered by the general surgeon are acute appendicitis and acute cholecystitis.

Acute appendicitis occurs with the same frequency in gravid and nongravid females of the same age, leading to appendectomy in one out of every 2000 pregnancies [28]. In this setting, suspected appendicitis must be treated as if the patient were not pregnant. Thus the suspicion of appendicitis usually merits operative exploration. Indeed, delay with resultant appendicle rupture may have dire fetal and maternal consequences.

Acute cholecystitis leads to surgical intervention less frequently, partly due to the availability of effective non-surgical therapeutic alternatives. Cholecystectomy is required in 1-6 out of every 10000 pregnancies [29]. Despite the effectiveness of non-operative care, pregnant patients with symptomatic gallstones have a high rate of recurrent symptoms. Nearly 70% of patients with gallstones pancreatitis will have recurrent biliary pain usually requiring hospitalization. Fetal loss in patients with gallstone pancreatitis is 10-20% [30, 31].

Currently, in nonpregnant patients, appendectomy and cholecystectomy are frequently performed laparoscopically. While pregnancy has been considered a relative contraindication to laparoscopy, recent reports have refocused attention on this issue [32, 33, 34].

Potential advantages of laparoscopic appendectomy and cholecystectomy in the pregnant patient include decreased fetal depression due to lessened postoperative narcotic requirements [35, 36,37], lower risks of wound complications [34,37,38,39] and diminished postoperative maternal hypoventilation [37,38]. Additional benefits may include more rapid maternal recovery.

Most case reports and small series indicate that laparoscopy can be safely performed during pregnancy. Despite the growing clinical experience suggesting laparoscopy is safe as laparotomy in pregnancy, long-term clinical studies are lacking.

To avoid and minimize the fetal and maternal risks during laparoscopic surgery in pregnancy, it is recommended to follow the guidelines for laparoscopic surgery during pregnancy. The following guideline is suggested:

1. Pre operative obstetrical consultation should be obtained.

2. Operative intervention should be deferred until second trimester.

3. Pneumoperitoneum pressures should be minimized to 8-12mmHg.
4. Left lateral position of the patient to avoid supine hypotension syndrome.

5. Use of open access technique during laparoscopy in advanced pregnancy.

6. The uterus should be protected with a lead shield if radiological investigations are needed.

7. Pneumatic compression devices should be used to reduce thromboembolic disorders.

8. Fetal and maternal end tidal CO2 and arterial blood gases should be monitored.

9. Capnography, Pulse oximetry, NIBP and ECG should be strictly monitored.

Conclusion

Laparoscopic surgery widely used in the last 3 decades by both gynecologists and general surgeons, because of its major advantages. With the advancement in anesthesia and laparoscopy, it has been used in three trimester of pregnancy for different intra-abdominal obstetrical and non-obstetrical pathologies. Laparoscopic surgery can be performed safely during pregnancy, but possible complications, such as uterine injury, difficulty during procedure, increased intra-abdominal pressure and CO2 absorption by the fetus and the mother should be considered seriously. Most of the data available are case report and small series, and these are not enough to make conclusion about this procedure safety and complication rate. Laparoscopic surgery for abdominal disorders during pregnancy make big challenge to the surgeon, the severity of the primary underlying pathology, not the surgery, appear to have the most important factor determining fetal and maternal outcome. We suggest that prospective, controlled and randomized studies should be conducted to assess the superiority of laparoscopy in pregnancy.

REFERENCES


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