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Laparoscopic Surgery for Non-Obstetric Emergencies During Pregnancy: A Case Series

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Abstract: ***Background:*** *Non obstetric surgical emergencies during pregnancy require prompt intervention to reduce maternal and fetal morbidity. Laparoscopy during pregnancy, in spite of its benefits, concerns remain regarding optimal timing, intraabdominal pressure, and fetal monitoring, necessitating careful patient selection and multidisciplinary management.* ***Aim:*** *To study the feasibility and effectiveness of laparoscopic surgery during pregnancy, particularly for non obstetric indications incorporating the results of series of 7 gravid patients in a laparoscopy institute in a rural area in India.* ***Methodology:*** *We retrospectively analysed the clinical data of 7 pregnant patients who underwent laparoscopy for non obstetric indications in our institution.* ***Results:*** *Of the 7 gravid patients, 2 patients underwent laparoscopic cholecystectomy, 4 patients underwent laparoscopic ovarian cystectomy and 1patient underwent salphingo oophorectomy. Laparoscopy was done during the 1st trimester in 2 patients and during the 2nd trimester in other patients. All procedures were successfully completed without conversion to open surgery. There were no major intraoperative complications. Postoperative recovery was uneventful and all patients continued their pregnancies with favourable maternal and fetal outcomes.* ***Conclusion:*** *Laparoscopy for pregnant patients can be safely performed in all trimesters with appropriate precautions and interdisciplinary collaboration.*

Keywords: laparoscopy, non- obstetric surgery, adnexal mass in pregnancy, minimally invasive surgery

1. Introduction

Non obstetrical surgical problems complicate upto 2% to 3% of pregnancies [1],[2]. The most common non obstetric emergencies complicating pregnancy are appendicitis, cholecystitis, and adnexal cyst with rupture or torsion [3],[4]. Technological advances in laparoscopy and availability of well- trained surgeons and advanced anesthesiologic modalities have made laparoscopy the preferred surgical technique in gravid patients. Moreover, laparoscopy has the advantage over open surgery in faster recovery, shorter hospital stay, and lower rates of wound infection [5]. However, laparoscopy presents a dilemma in pregnancy because of the risk of uterine injury from initial port placement and possible fetal distress due to high intra- abdominal pressure created by pneumoperitoneum.

2. Materials and Methods

Gravid patients who underwent laparoscopic surgery for non-obstetric causes between May 2022 and February 2025 in Siva Institute of Minimal Access Centre, Tamil Nadu, India were included in this study. Clinical information including patient demographics, detailed medical and obstetric history, indications, surgical techniques, pre operative, intra operative and postoperative data, complications, and pregnancy outcomes were collected and analysed.

3. Results

Non obstetric urgent laparoscopic surgery was performed in 7 gravid patients. The patients age ranged between 24 and 35 years. Gestational age ranged between 9weeks and 24 weeks. Of the 7 patients, one had twin pregnancy and others had singleton pregnancies. Two patients had history of previous cesarean section while other 5 patients were Primigravida. Laparoscopy was done during the 1st trimester in 2 patients and during second trimester in other patients. 2 patients underwent laparoscopic cholecystectomy for acute cholecystitis, 4 patients underwent laparoscopic ovarian cystectomy and one patient underwent laparoscopic salphingo oophorectomy. Of the 5 patients with ovarian cysts, 1 patient had dermoid cyst, 1 patient had hemorrhagic cyst, 1 patient had serous cystadenoma and other 2 patients had simple cysts with features of torsion. Ultrasound was used as diagnostic modality in all the 7 patients and additional MRI was done in 1 patient and the findings were relevant with laparoscopy findings. Acute abdominal pain was the predominant symptom in all the 7 patients (Table 1).

Table 1: Clinical profile of patients

	Age	Obstetric code	Babies	Gestational age	Symptom	Diagnostic testing	Diagnosis
1	35	G2P1L1/ LSCS	Singleton	22wks 1d	Abdomen pain	USG	Acute calculus cholecystitis
2	28	G2P1L1/ LSCS	Twins	24wks	Abdomen pain	USG	Acute calculus cholecystitis
3	24	Primi	Singleton	12wks 4d	Abdomen pain	USG & MRI	Left ovarian cyst 10x12 cm with torsion
4	27	Primi	Singleton	20wks 6d	Abdomen pain	USG	Rt ovarian torsion with cyst 4.2x3.8cm
5	30	Primi	Singleton	9wks 6d	Abdomen pain	USG	Left ovarian torsion with cyst 6.4x6cm
6	28	Primi	Singleton	18wks	Abdomen pain	USG	Rt ovarian dermoid cyst 7x6cm with torsion
7	25	Primi	Singleton	16wks 2d	Abdomen pain	USG	Rt ovarian cyst 6x5cm with torsion

After obtaining informed written consent, Surgeries were performed under general anesthesia. Single dose of iv antibiotic was given preoperatively. Patient was placed in supine position. Compression stockings were applied throughout the procedure to prevent thrombosis. Pneumoperitoneum was created using veress needle at the umbilicus or Jain point or palmer point depending on the size of uterus and previous surgery, before port placement. Intraabdominal pressure was maintained between 9 and in the right hypochondrium. In ovarian cystectomy and salphingo oophorectomy, one 10mm camera port and two or three 5mm working ports were inserted depending on the size and site of pathology. The specimen was retrieved through 10mm port with the help of Endobag to avoid spillage. In one patient with twin pregnancy and previous history of cervical incompetence, cervical encirclage was performed along with 10mm Hg. The site of the port was decided depending upon the gestational age, uterus size, and diagnosis. After insertion of camera port, accessory ports were placed under vision. When the size of uterus or pathology was uncertain, 5mm scope was introduced through Jain point or Palmer point and other ports were placed under vision. In laparoscopic cholecystectomy, two 10mm ports, one in the supraumbilical region (depending on the uterine size) and other in the epigastric region were made and two 5mm ports were made laparoscopic cholecystectomy to prevent preterm labour. Fetal heart rate was monitored using ultrasound before and after the procedure. Duration of surgery ranged from 30 minutes to 1 hour. Postoperatively, patients were treated with iv antibiotics, paracetamol for pain management, tocolytics and other supportive measures (Table 2).

Table 2: Surgery detail of the patients

	Surgery	Camera port	Working port	Intra abdominal pressure	Compli-cations	Maternal and fetal outcomes
1	Lap Cholecystectomy	Supraumbilical	3	10	Nil	Elective LSCS at 38 weeks
2	Lap Cholecystectomy Cervical encirclage	Supraumbilical	3	10	Nil	Emergency LSCS at 32 wks due to preterm labour
3	Lap Left Ovarian Cystectomy	Umbilical	2	10	Nil	Emergency LSCS at 38 wks – fetal indication
4	Lap Right Ovarian Cystectomy	Supraumbilical	2	10	Nil	Normal Vaginal Delivery at 38 wks
5	Lap Left Salphingo Oophorectomy	Umbilical	2	10	Nil	Emergency LSCS at 37wks – fetal indication
6	Lap Right Ovarian Cystectomy	Umbilical	3	10	Nil	Normal Vaginal Delivery at 39wks
7	Lap Right Ovarian Cystectomy	Umbilical	2	10	Nil	Normal Vaginal Delivery at 38 wks

Intraoperatively and postoperatively, no adverse events or complications were reported. All the 7 patients had regular antenatal visits and follow up. Out of the 7 patients, 1 patient with twin pregnancy and previous LSCS had preterm labour, delivered two alive babies by LSCS. Other patient with previous cesarean section underwent elective LSCS and delivered a healthy baby at 38 weeks. Out of the 5 primigravida who underwent laparoscopic surgery, two had emergency cesarean section due to fetal indication and other 3 had Normal Vaginal Delivery without any complications

4. Discussion

Approximately 1 in 500 women require non obstetrical abdominal surgery during pregnancy [6], [7]. The most common non obstetrical surgical emergencies complicating pregnancy are acute appendicitis and cholecystitis [3]. Other conditions that may require surgery during pregnancy include ovarian cysts, masses or torsion, symptomatic cholelithiasis, adrenal tumors, splenic disorders, symptomatic hernias, complications of inflammatory bowel diseases, and other rare conditions. Previously, laparoscopy was contraindicated during pregnancy due to concerns for uterine injury from trocar placement and fetal malperfusion due to pneumoperitoneum. As surgeons gained more experience and documented their outcomes, laparoscopy has become the preferred treatment modality for many surgical diseases in gravid patients.

Symptomatic gallbladder disease is one of the most common cause for non obstetric surgery during pregnancy. Gallstones are present in 12% of all pregnancies and more than one third of the patients with symptoms fail conservative management and require cholecystectomy. Laparoscopic cholecystectomy during pregnancy is associated with shorter hospital stay, shorter operative times and fewer complications compared to open cholecystectomy [5]. There have been no reports of fetal demise for laparoscopic cholecystectomy performed during

the first and second trimesters. Furthermore, decreased rates of spontaneous abortion and preterm labor have been reported after laparoscopic cholecystectomy when compared to laparotomy [8]. In our study, two gravid patients successfully underwent laparoscopic cholecystectomy during second trimester of pregnancy without any adverse events. Given the lower risk of laparoscopic cholecystectomy to the pregnant woman and fetus, the procedure can be considered for all gravid women with symptomatic gallstones.

The incidence of adnexal masses during pregnancy is 2%. Most of these adnexal masses discovered during the first trimester are functional cysts that resolve spontaneously by the second trimester. 80% to 95% of adnexal masses < 6cm in diameter in pregnant patients spontaneously resolve. 10% to 15% of adnexal masses undergo torsion. Laparoscopy is the preferred method for both diagnosis and treatment in gravid patients with adnexal torsion [9]. If diagnosed before tissue necrosis, adnexal torsion may be managed by simple laparoscopic detorsion . However, with late diagnosis of torsion, the gangrenous adnexa should be completely resected. In our study, 5 gravid patients presented with Abdomen pain and diagnosed with adnexal cysts with torsion. 4 patients underwent detorsion with ovarian cystectomy and 1 patient underwent salphingo oophorectomy.

Abdomen pain is the commonest presenting symptom in pregnant patients and poses a challenge in selecting the diagnostic approach. Ultrasound is an easily applicable, safe and effective technique in determining both obstetric and non obstetric causes of abdomen pain. For biliary pathology in gravid patients, the diagnostic accuracy of ultrasound is above 90% and in pregnant patients with right lower abdominal pain, appendix can be visualized in up to 60% of cases [10]. When sonography is not diagnostic and more thorough imaging of abdomen or pelvis is required, MRI can be safely performed at any stage of pregnancy without exposing the patient and developing fetus to ionising radiation. In all our cases, ultrasound was done and in addition, MRI was done in 1 patient and the diagnosis was relevant with laparoscopy findings.

The recommendation for non emergent procedures during pregnancy has been to avoid surgery during the first and third trimesters to minimize the risk of spontaneous abortion and preterm labor respectively. This has led to delaying surgery until the second trimester [11]. However recent literature has demonstrated that pregnant patients may undergo laparoscopic surgery safely during any trimester without an increased risk to the mother or fetus [12],[13]. Importantly, postponing necessary operations until after parturition has been shown in some cases, to increase the rates of complications for both mother and fetus [14]. In our 7 gravid patients, laparoscopy was successfully performed during first trimester and second trimester without any complications.

When a pregnant patient is placed in supine position, the gravid uterus places pressure on the inferior vena cava resulting in decreased venous return to the heart. This decrease in venous return leads to reduction in cardiac output with concomitant maternal hypotension and decreased placental perfusion during surgery. Placing the patient in a left lateral decubitus position will shift the uterus off the vena cava improving venous return and cardiac output [15],[16]. If abdominal access is compromised in the full decubitus position, the partial left lateral decubitus position can be used. Pregnant patients in their first trimester do not require altered positioning as the small size of the uterus does not compromise venous return. In our study, we adopted supine position with left lateral tilt according to the trimester and there was no maternal or fetal compromise.

Any abdominal entry technique can be safely used during pregnancy. Open technique, Veress needle, or direct entry are equally safe and the decision should be based on the surgeon's training and experience, surgical volume, and individual patient's conditions, including uterine height [17]. The site of initial abdominal access is adjusted according to fundal height of uterus and the abdominal wall is elevated during insertion to avoid injury. During the second and third trimesters, alternative entry points, such as the Lee-Huang, Palmer or Jain point can be used [18]. Ultrasound guided trocar placement has been described in the literature as an additional safeguard to avoid uterine injury [19]. Accessory trocars should always be placed according to the condition to be treated and uterine size under direct visualization to avoid unnoticed injury to the uterine fundus and other intra-abdominal structures [17]. In our 7 patients, we created pneumoperitoneum using veress needle at site depending on the uterus size before port placement. After insertion of the camera port, other ports were placed under vision at sites depending on the surgery and uterus size.

The intra-abdominal pressure should be adjusted according to the physiology of the patient and the gestation trimester, due to the displacement of the diaphragm by the pneumoperitoneum. SAGES states that the operating pressure should be based on each patient's comorbidities and physiology, within the limits of 10-15 mm Hg [20]. It is recommended to keep intra-abdominal pressure under 12 mmHg, after the main and accessory ports are placed. No increase in adverse maternal or fetal outcomes has been noted. Intra-abdominal pressure under 12 mmHg has been demonstrated to provide the same visualization as higher pressures and less post-surgical pain [17]. In our 7 cases, we used intraabdominal pressure of 9-10mmHg without any complications or adverse events.

While intraoperative fetal heart rate monitoring was once thought to be the most accurate method to detect fetal distress during laparoscopy, no intraoperative fetal heart rate abnormalities have been reported in the literature. Preoperative and postoperative monitoring of the fetal heart rate for a fetus considered viable is the current standard, with no increased fetal morbidity [21]. The current lower limit of viability is between 22 weeks and 24 weeks. Concurrent contraction monitoring to confirm the absence of contractions may also be implemented in fetuses considered viable. In all our 7 patients, we monitored the fetal heart rate before and after the procedure using ultrasound.

Pregnancy is a hypercoagulable state with 0.1%-0.2%

incidence of deep venous thrombosis. CO2 pneumoperitoneum may increase the risk of deep venous thrombosis by predisposing to venous stasis. Insufflation of 12 mmHg causes a significant decrease in blood flow that cannot be completely reversed with intermittent pneumatic compression devices [22]. Because of the increased risk of thrombosis, prophylaxis with pneumatic compression devices both intraoperatively and postoperatively and early postoperative ambulation are recommended. In patients who require anticoagulation during pregnancy, unfractionated heparin has proven safe and is the agent of choice [23]. The patient's history and associated clinical factors should be evaluated to define time and length of use. In our patients, compression stockings were used intraoperatively and postoperatively, heparin was given for high risk patients for thromboprophylaxis.

Regarding the use of tocolysis, the BSGE, SAGES, and SOCG advise against its use on a routine basis and it should be reserved for cases when signs of preterm labor are present. The specific agent and indications for the use of tocolytics should be individualized and based on the recommendation of an obstetrician [24]. The routine anti-D administration is not regarded as necessary [25]. Corticosteroid and magnesium sulfate use should be contemplated for patients with fetuses at viable premature gestational ages. Tocolytics were given for our patients postoperatively depending on the risk factors.

Paracetamol is the drug of choice for post-surgical pain management in pregnant women [26]. It should be used in the lowest possible effective dose and for short periods of time. Opioids can be used for post-surgical pain control in pregnancy. Oxycodone, fentanyl, and morphine are category B. Tramadol and codeine are category C and should be avoided in the first trimester. Epidural is a viable option for analgesia after thorax, abdomen, and lower extremities surgeries. The use of NSAIDs should be avoided, especially after 32 weeks due to their cardiovascular fetal effects. We used Paracetamol intravenous infusion for postoperative pain management for all our patients. The small sample size and single centre study limits the generalized application of the results.

5. Conclusion

Laparoscopic surgery during pregnancy has proven to be a safe and effective option for managing acute surgical pathologies. In recent years, it became the standard of care, due to its safety, efficacy, maternal–fetal benefits, and low morbidity. Personnel trained and experienced in minimally invasive surgery, as well as multidisciplinary teams, adequate facilities, and appropriate surgical instruments are key for its successful implementation.

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