

Laparoscopy in pregnancy

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PERINATOLOGIST

INTRODUCTION

- The advantages of laparoscopic surgery **are similar** for pregnant and nonpregnant women
- **nevertheless**, this procedure had been avoided during pregnancy because of concerns that it may be harmful to the fetus

Potential concerns

- ●The **rise in intraabdominal pressure** during pneumoperitoneum could **decrease utero-placental blood flow and result in fetal hypoxia.**
- ●**Fetal acidosis** could develop from absorption of carbon dioxide (CO₂).
- ●The fetus could **be injured directly or indirectly** if the uterus is perforated by a trocar or Veress needle.
- ●**Uterine perforation** may result in **preterm premature rupture of the membranes and preterm delivery**


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- Appendicitis, gallbladder disease, mesenteric cysts, and adnexal masses/torsion
 - **advanced laparoscopic** procedures, such as radical nephrectomy, splenectomy, adrenalectomy, retroperitoneal lymphadenectomy, and ventral hernia repair,

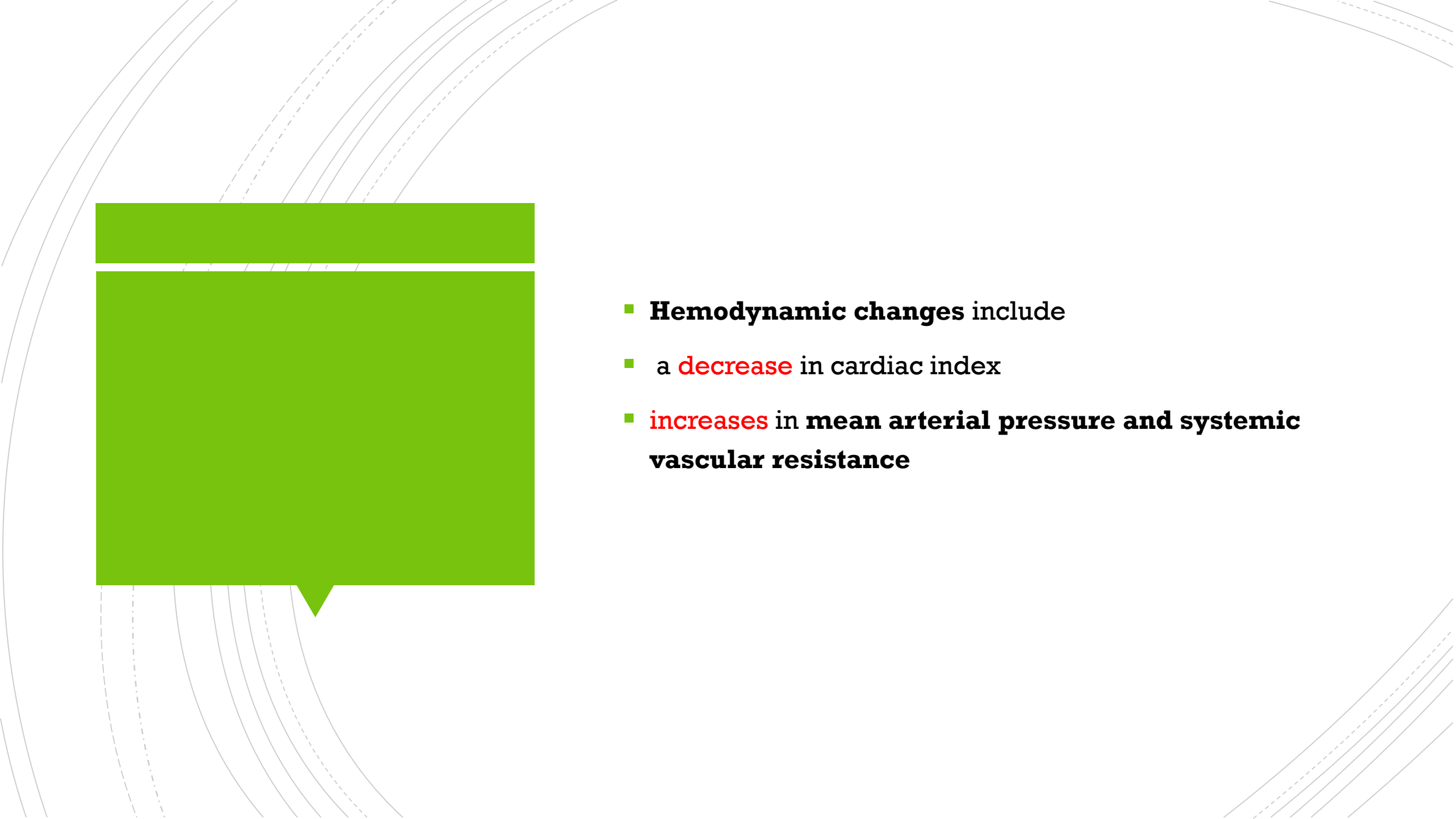
SAFETY Maternal

- **less risk** than laparotomy
- In a retrospective study of **nearly 2000 pregnant** women that compared open and laparoscopic appendectomy and cholecystectomy, laparoscopic surgery was associated with **shorter operative times, shorter length of stay, and fewer complications compared** with open surgery
- In a national cohort study of nearly **20,000** women undergoing appendectomy or cholecystectomy during pregnancy, **open surgery was associated with a threefold increased risk of postoperative obstetric complications**, including preterm delivery, preterm labor without preterm delivery, and miscarriage, when compared with laparoscopy

SAFETY Fetal

- laparoscopic procedures in all trimesters of pregnancy **with minimal morbidity** to the fetus and mother
- compared the outcome of **2181** laparoscopies performed on pregnant patients **prior to 20** weeks of gestation with the outcome of 1522 laparotomies performed in a similar population. There were **no significant differences** between groups in any measured outcome: birth weight, gestational duration, intrauterine growth restriction, congenital malformations, stillbirths, or neonatal deaths. No adverse long-term effects have been reported,

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- **Pneumoperitoneum** can alter
 - maternal hemodynamics,
 - arterial oxygenation,
 - and acid-base balance as a **result of CO₂ absorption**.
 - Pressure on uteroplacental vessels can decrease uterine blood flow,
 - **upward displacement of the diaphragm** further reduces maternal residual lung volume and **functional residual capacity**.

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- The background of the slide features a series of thin, curved lines in shades of gray, creating a sense of motion and depth. These lines are more prominent on the left side and fade towards the right.
- **Hemodynamic changes include**
 - a **decrease** in cardiac index
 - **increases** in **mean arterial pressure and systemic vascular resistance**

Fetal loss

- In the 2012 meta-analysis of 11 studies that included **3415 women**, the risk of **fetal loss was greater** for laparoscopic versus open appendectomy in pregnant women
- the largest study to date, which included nearly 20,000 women undergoing either appendectomy or cholecystectomy, open surgery was associated with a higher risk of adverse obstetric outcome, including miscarriage, when compared with laparoscopic surgery
- We counsel women undergoing laparoscopic surgery that data from the largest study indicate that the laparoscopic **route is safer than the open** approach, **but the overall body of evidence is mixed.**

INDICATIONS

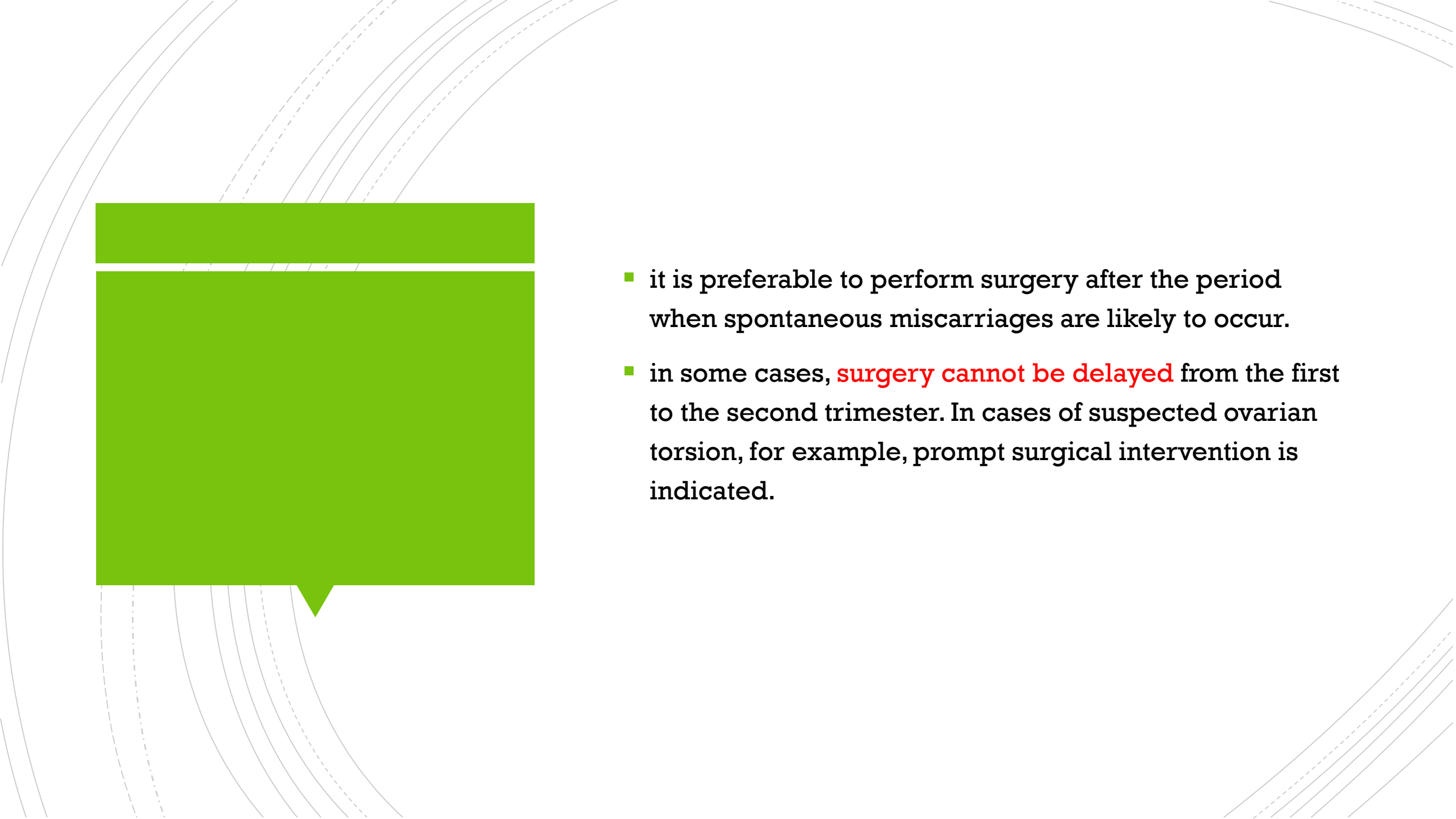
- the surgical approach (laparotomy or laparoscopy) is based **on the skills** of the surgeon and **the availability** of the appropriate staff and equipment.
- **The indications for** laparoscopic treatment of acute abdominal processes and **benefits** of the laparoscopic approach are the same in pregnant and nonpregnant patients
- **Hemodynamic instability is a contraindication** to using a laparoscopic approach.
- Laparotomy is often preferred to laparoscopy in the presence of **a large solid ovarian mass** on preoperative ultrasonography, and when **the patient has had multiple prior surgeries and/or a history of adhesive disease.**

BENEFITS

- The benefits of laparoscopy during pregnancy are **similar** to those in nonpregnant patients:
- less postoperative pain,
- less postoperative ileus,
- reduction in adhesion formation,
- shorter hospital stay,
- and faster return to usual activities
- less uterine manipulation intraoperatively during laparoscopic procedures than during laparotomy
- avoidance of a large abdominal scar while the uterus is enlarging results in a better cosmetic outcome and less postoperative discomfort (lower narcotic requirements, better respiratory effort
- provide better exposure than laparotomy because of **optical magnification, lighting, and other technical factors.**

TIMING

- can be performed in **any trimester**
- the optimal time to operate is the **early second trimester**.
- When surgery is required during the **third trimester**, the enlarged uterus can interfere with adequate visualization.
- successful laparoscopic management of appendicitis, cholecystitis, intussusception, and an adnexal mass has been described in the third trimester, as late as 34 weeks of gestation
- There is **no absolute** maximum gestational age for performing laparoscopy; we will perform these procedures in the early third trimester
- procedures performed in the first trimester **should be easier technically, introducing a potential teratogen during** organogenesis is a concern.

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- it is preferable to perform surgery after the period when spontaneous miscarriages are likely to occur.
 - in some cases, **surgery cannot be delayed** from the first to the second trimester. In cases of suspected ovarian torsion, for example, prompt surgical intervention is indicated.

PROCEDURE

- Prior to initiating the procedure, an **oro- or naso-gastric** tube is inserted into the stomach **to prevent perforation** of a distended stomach, and to reduce the risk of aspiration of gastric contents.
- A Foley catheter is placed in the bladder.

Thromboprophylaxis

- **no data** from randomized trials on the use of unfractionated or low molecular weight heparin or intermittent pneumatic compression for venous thromboembolism prophylaxis in pregnant patients undergoing laparoscopy.
- The Society of American Gastrointestinal and Endoscopic **Surgeons recommends placing pneumatic compression devices on the lower limbs of pregnant women** undergoing laparoscopic procedures for surgical problems

Thromboprophylaxis


- The 2012 American College of Chest Physicians (ACCP) clinical practice guideline **on prevention** and treatment of thrombosis recommends **mechanical or pharmacologic** thromboprophylaxis for pregnant patients undergoing surgery
- For laparoscopic procedure (gynecologic or general surgical) likely to take >45 minutes, use of low molecular weight heparin is suggested; **mechanical thromboprophylaxis is a reasonable alternative for shorter procedures**


Prophylactic tocolysis

- There is **no evidence to support** the use of prophylactic tocolytics or glucocorticoids.
- these drugs may be **indicated in management of threatened preterm delivery**.

Patient position


- the patient is **placed in the supine or low lithotomy position with a leftward tilt (after 16 weeks of gestation)** to avoid significant compression of the aorta and inferior vena cava.
- *Left lateral rotation* of the operating table may also help to displace the uterus adequately
- such positioning may make the surgical procedure more difficult because the gravid uterus may **block the surgeon's view**, such as with a left adnexal mass.
- In these cases, we utilize a hand-assist port to dislodge the adnexa from behind the uterus and bring it into operative view.

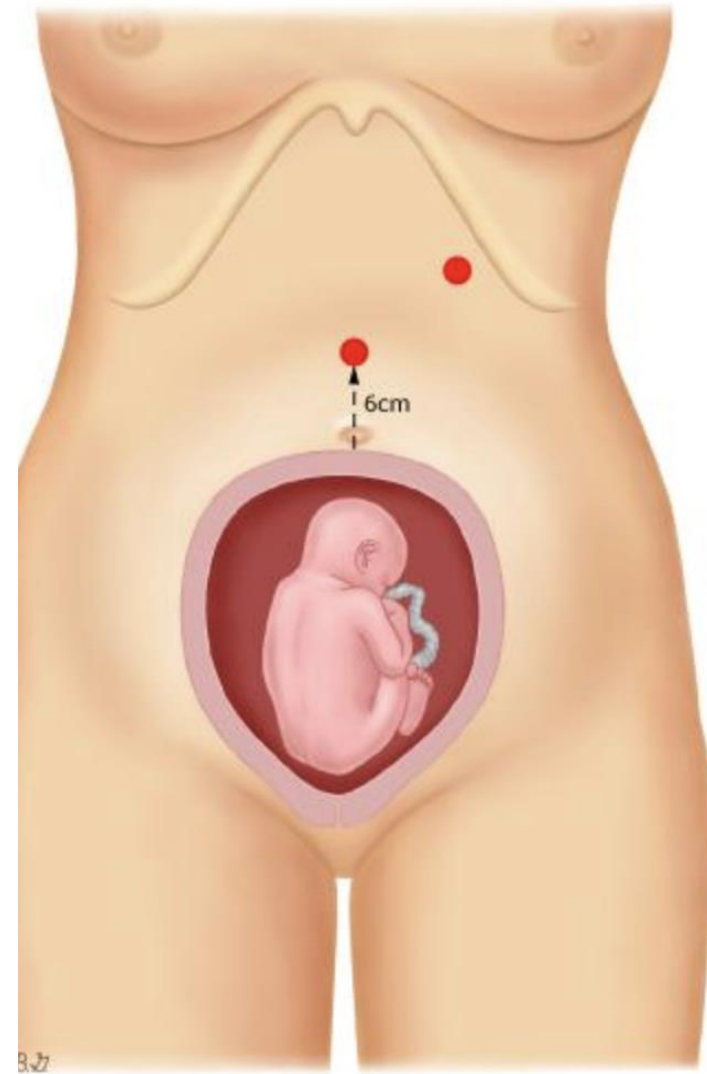
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- The patient can temporarily **be taken out of left lateral tilt to facilitate this manipulation.**
 - After a pneumoperitoneum has been created, the patient's position can be adjusted further to allow gravity to aid with visualization.
 - varying degrees of Trendelenburg position can move the intestines cephalad and thus improve visualization for procedures in the pelvis.
 - **The amount of Trendelenburg position** that a pregnant woman will tolerate depends **on the patient's habitus, co-morbid risk factors, and gestational age of the pregnancy.**


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- **Left-sided rotation of 30 degrees with chest and thigh restraining straps improves visualization** of the appendix and gall bladder during laparoscopic appendectomy and cholecystectomy in the third trimester
 - These positions displace the gravid uterus off of the inferior vena cava, in addition to exposing the right paracolic gutter.

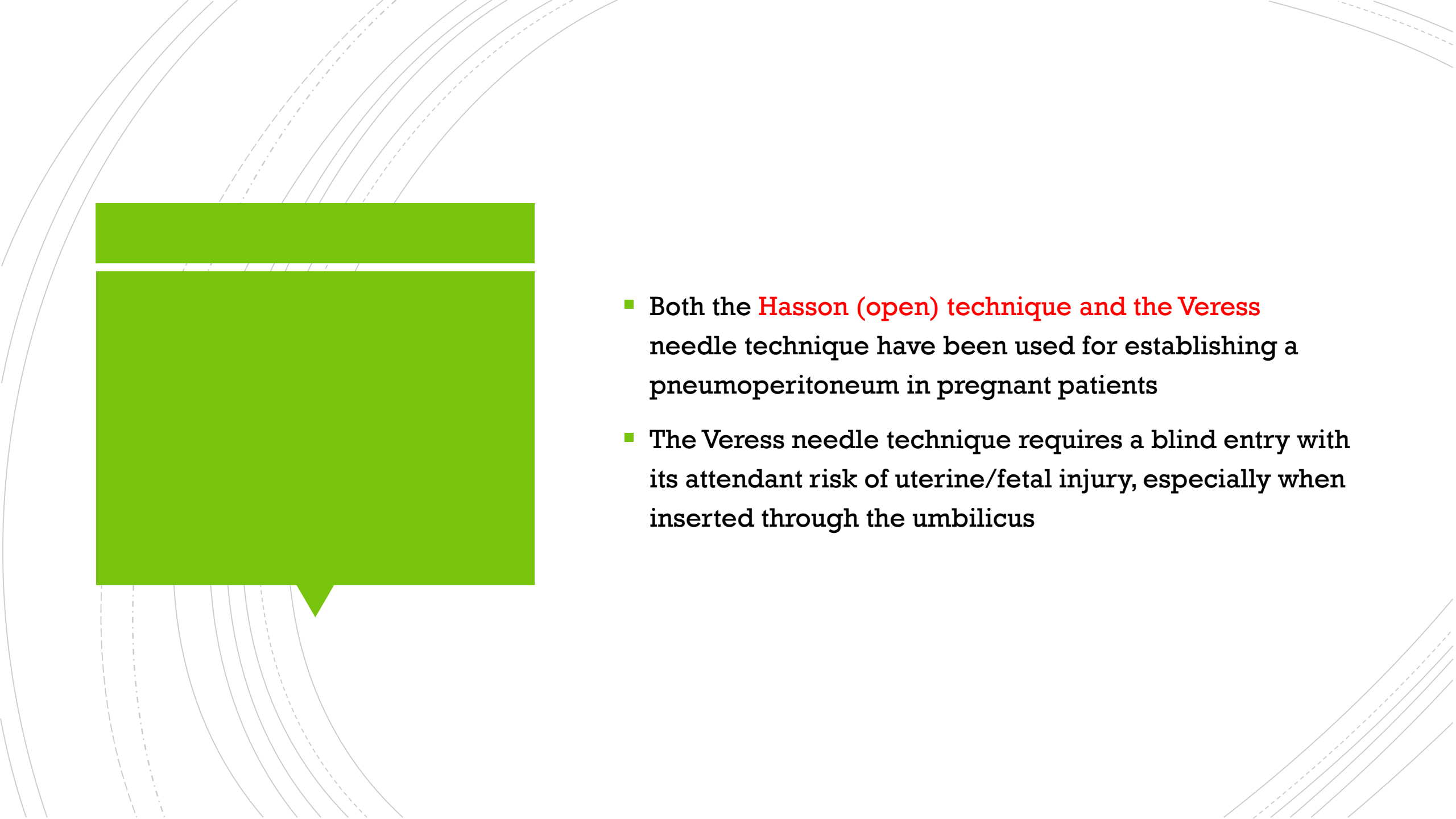
Trocar placement/insertion


- the gravid uterus makes trocar insertion and creation of a pneumoperitoneum more difficult and potentially more hazardous.
- Inadvertent placement of a Veress needle through the umbilicus into the pregnant uterus has been described

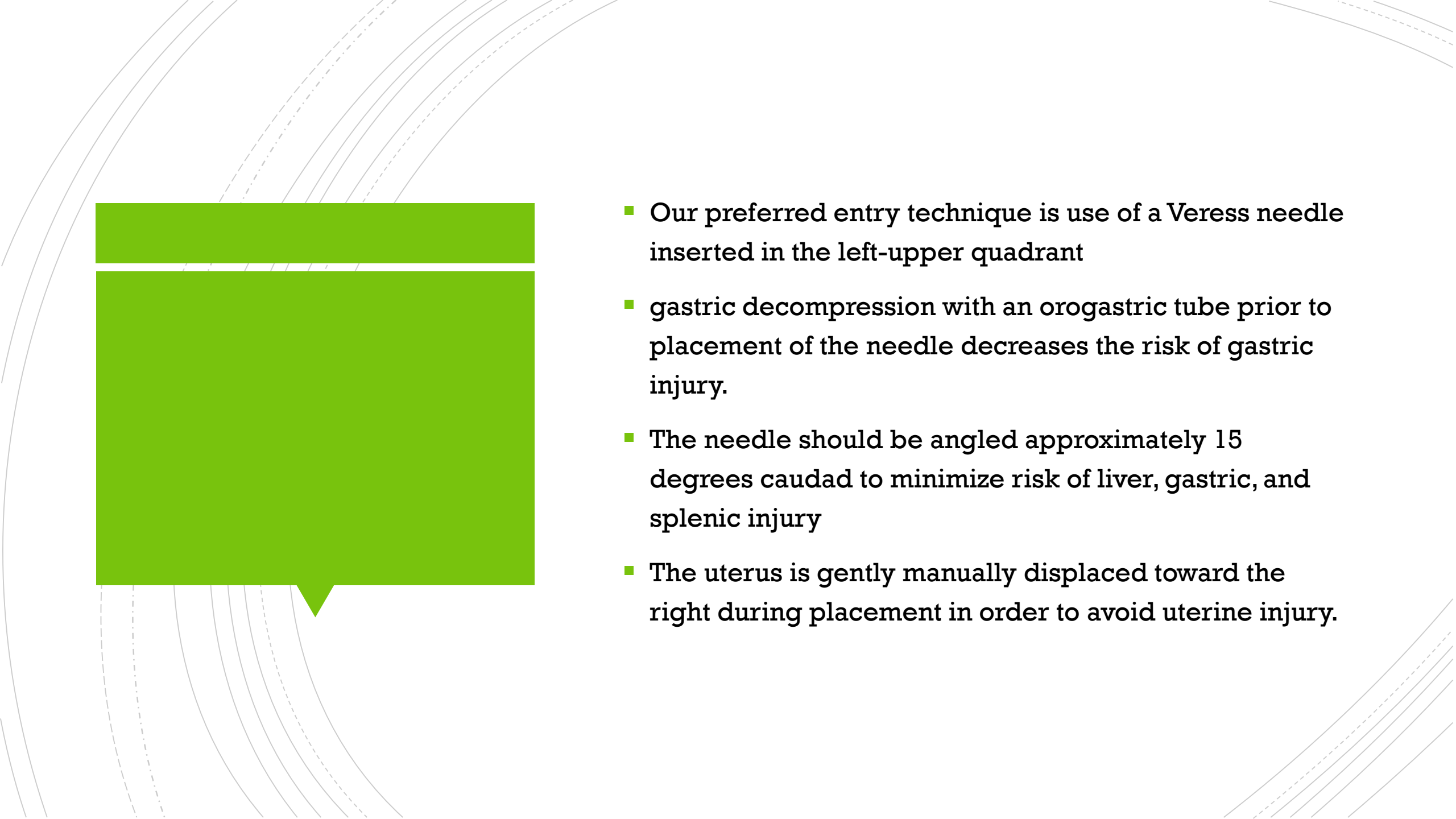

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- **Supraumbilical** primary trocar placement is a common practice; we suggest positioning the **port at least 6 cm above the uterine fundus** and elevating the abdominal wall
 - This placement provides an adequate distance between the tip of the laparoscope and the uterus to allow optimal visualization and instrumentation.
 - With increasing gestational age, use **of the subxiphoid, left upper quadrant, or right upper quadrant** insertion points also helps to avoid the enlarged uterus.
 - Lateral displacement of the uterus during trocar insertion may also decrease the risk of uterine and fetal injury.

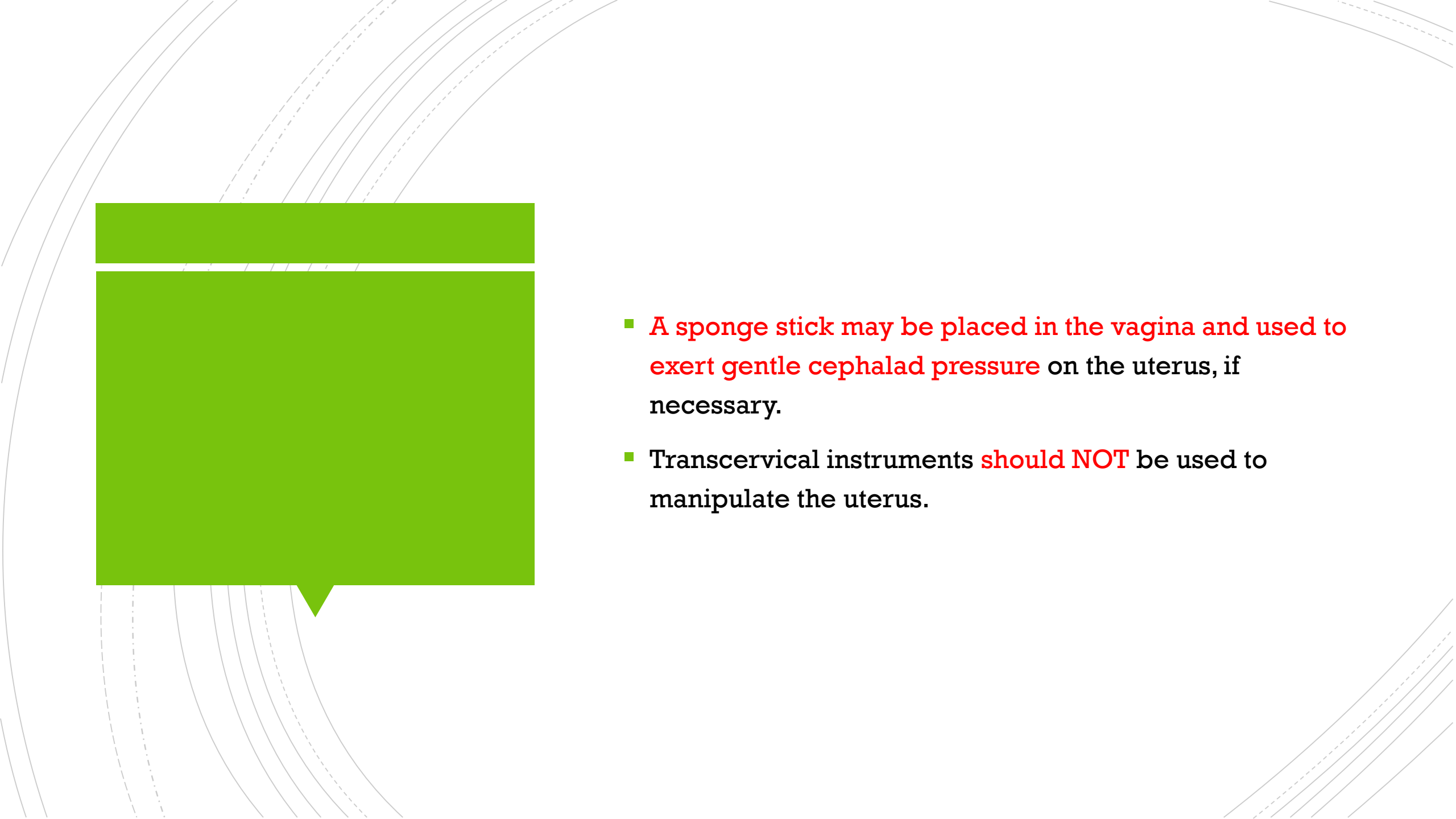


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- Our preferred entry technique is use of a **Veress needle** inserted into the left-upper quadrant.
 - **Gastric decompression** with an orogastric tube prior to needle insertion minimizes the risk of gastric perforation.
 - The needle should be **angled approximately 15 degrees caudad to minimize the risk of splenic injury.**
 - Placement of a supraumbilical port 6 cm above the fundus with a **Hasson technique** is another entry method that reduces the risk of organ perforation.

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- Both the **Hasson (open) technique** and the **Veress** needle technique have been used for establishing a pneumoperitoneum in pregnant patients
 - The Veress needle technique requires a blind entry with its attendant risk of uterine/fetal injury, especially when inserted through the umbilicus

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- A blind approach, however, was successfully used in a series of 10 third trimester procedures in which the Veress needle was inserted in **the mid-clavicular line, 1 to 2 cm below the costal margin in either the left or right upper quadrants**
 - Some surgeons recommend an **open technique** for trocar insertion because of greater assurance of safety
 - Given the feasibility of both methods, individual surgeons should use the technique with which they have the most experience and comfort

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- Our preferred entry technique is use of a Veress needle inserted in the left-upper quadrant
 - gastric decompression with an orogastric tube prior to placement of the needle decreases the risk of gastric injury.
 - The needle should be angled approximately 15 degrees caudad to minimize risk of liver, gastric, and splenic injury
 - The uterus is gently manually displaced toward the right during placement in order to avoid uterine injury.

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- A sponge stick may be placed in the vagina and used to exert gentle cephalad pressure on the uterus, if necessary.
 - Transcervical instruments **should NOT** be used to manipulate the uterus.


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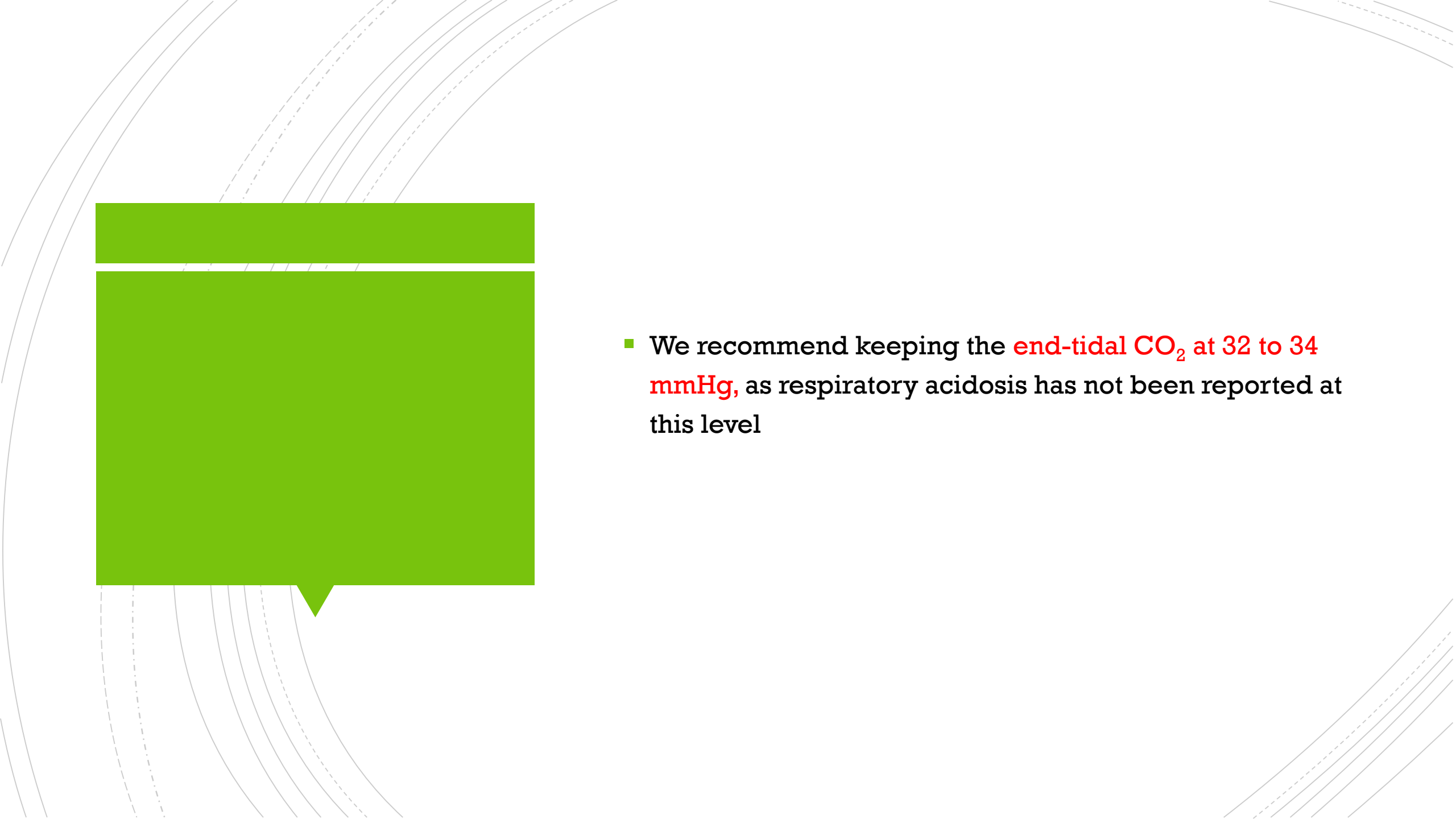
Laparoendoscopic single-site surgery (LESS),


- also referred to as single port laparoscopy, utilizes a single skin incision, through which a port with multiple operating channels is introduced.
- There are a few reports of use of LESS in pregnant women
- **Further study is needed before** LESS techniques can be recommended for use in the pregnant population

Pneumoperitoneum

- intraabdominal pressure needs to be sufficient to allow for adequate visualization,
- maintenance of a **low pressure** is mandatory,
- given the possible adverse effects of increased intraabdominal CO₂ pressures on the hemodynamic and respiratory physiology of the gravid patient.
- **Intraabdominal pressure between 8 to 12 mmHg and not exceeding 15 mmHg should be maintained**

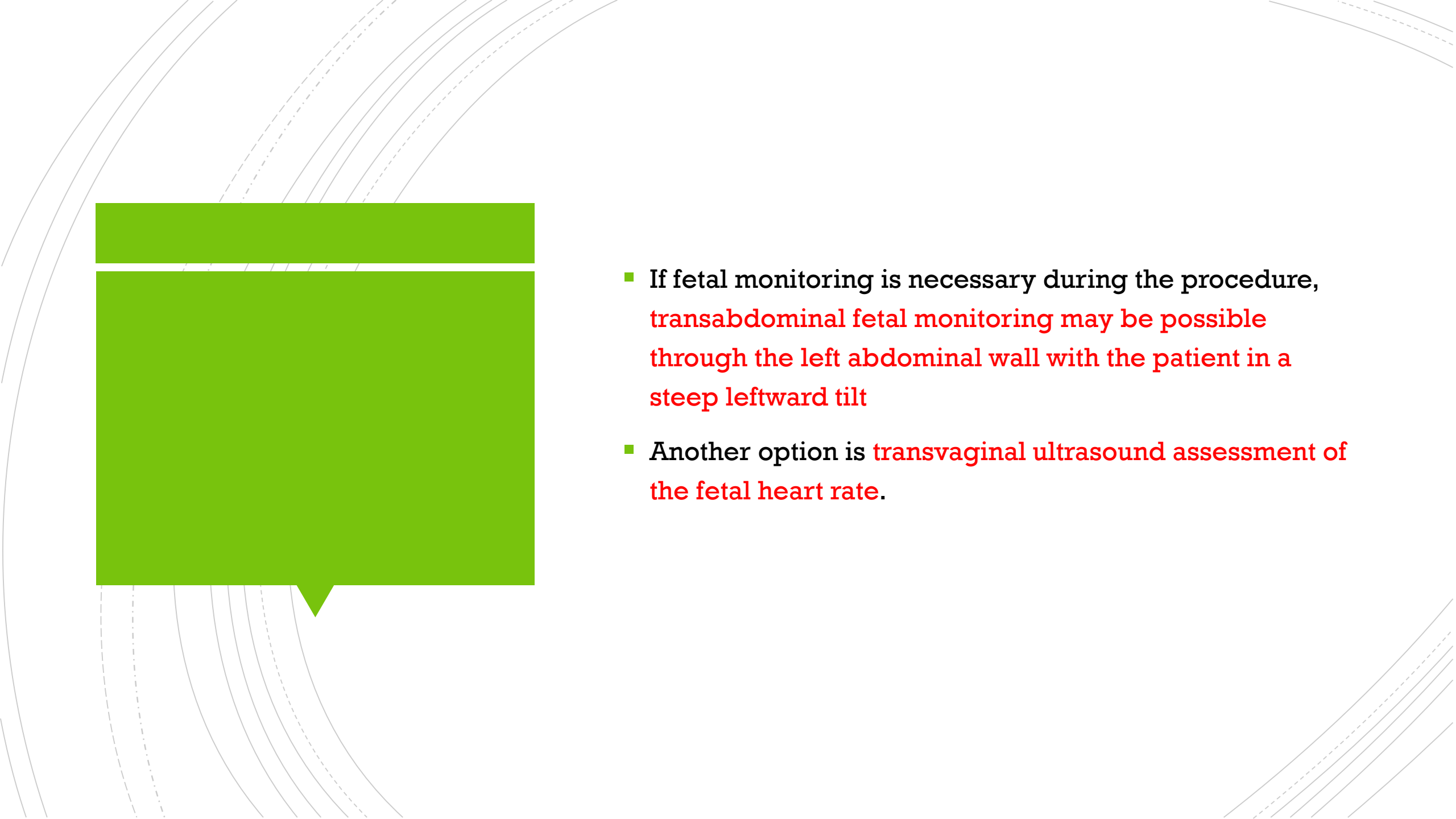
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- **Gasless laparoscopy** may be a safer alternative to the traditional CO₂ pneumoperitoneum, but **specialized abdominal wall lifting devices** are often necessary for a completely gasless procedure
 - using **a combination of pneumoperitoneum and abdominal wall retraction**
 - We perform laparoscopy with a CO₂ pneumoperitoneum, but we try to operate as efficiently as possible **to minimize** operative time and any potential maternal/fetal morbidity.


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- The background of the slide features a series of thin, curved, concentric lines in a light gray color, creating a subtle, modern aesthetic. These lines are more prominent on the left side and fade towards the right.
- We recommend keeping the **end-tidal CO₂ at 32 to 34 mmHg**, as respiratory acidosis has not been reported at this level

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- A study of eight pregnant women from 17 to 30 weeks of gestation undergoing laparoscopic cholecystectomy under general anesthesia measured changes in arterial to end-tidal carbon dioxide pressure difference ($\text{PaCO}_2\text{-PetCO}_2$) before, during, and after CO_2 pneumoperitoneum
 - There were no significant differences in either mean $\text{PaCO}_2\text{-PetCO}_2$ or PaCO_2 and pH during the various phases of laparoscopy, demonstrating that capnography is adequate to guide ventilation.
 - Respiratory acidosis did not occur when end tidal CO_2 was maintained at 32 mmHg.

Fetal assessment

- Fetal heart rate should be confirmed and documented before and after the procedure, and is usually done with a hand-held Doppler device (eg, Doptone).
- Due to the pneumoperitoneum, transabdominal fetal monitoring is **usually not possible during laparoscopy** in the second trimester.

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- If fetal monitoring is necessary during the procedure, transabdominal fetal monitoring may be possible through the left abdominal wall with the patient in a steep leftward tilt
 - Another option is transvaginal ultrasound assessment of the fetal heart rate.

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- If maternal acidosis is suspected and confirmed, it can be reversed by immediately hyperventilating the mother and decreasing intraabdominal pressure.
 - These measures can help to resuscitate the fetus by improving placental blood flow and fetal oxygenation

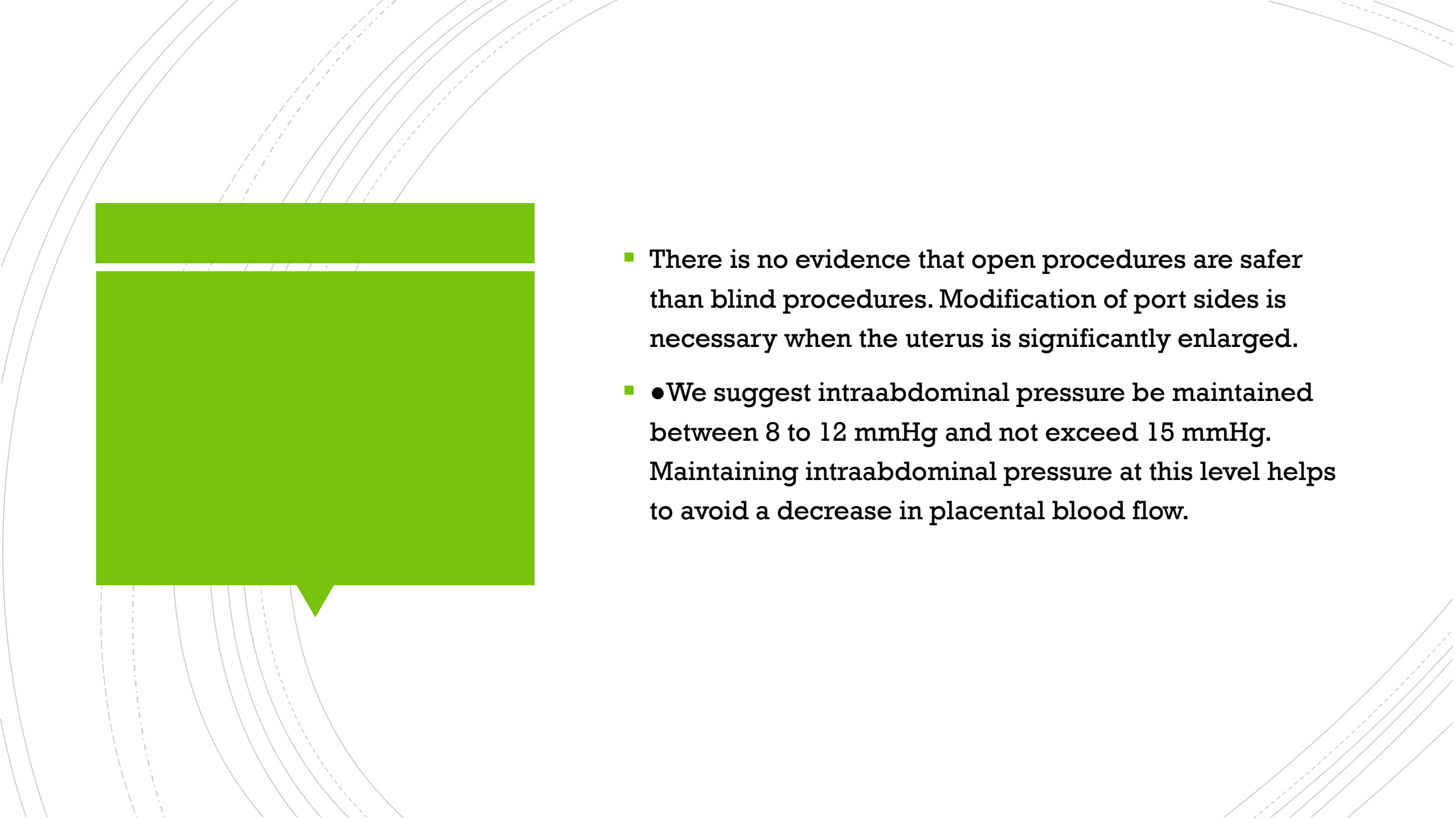


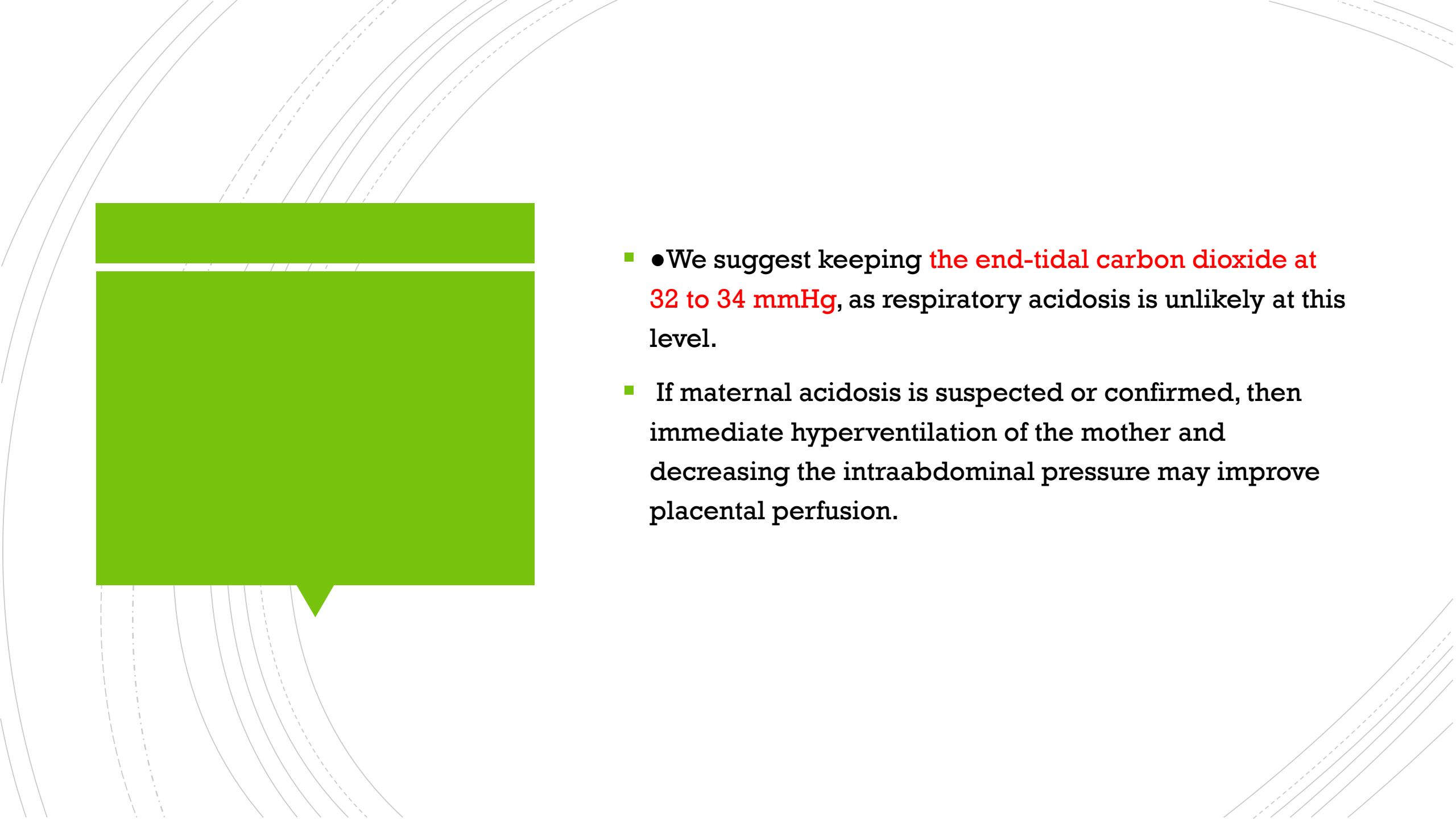
POSTOPERATIVE CARE

- Fetal heart rate and uterine activity should be monitored in the recovery room, as appropriate for gestational age.
- Opioids and antiemetics can be used, as needed, to control postoperative pain and nausea.
- Nonsteroidal anti-inflammatory drugs should be avoided, especially after 32 weeks of gestation, because they may cause premature closure of the fetal ductus arteriosus.
- Cesarean delivery is performed for standard obstetric indications; the presence of a recent abdominal incision does not preclude pushing in the second stage of labor.

SUMMARY AND RECOMMENDATIONS

- Laparoscopic surgery can be performed safely and effectively in pregnant women.
- ●The procedure has been performed **as late as 34 weeks of gestation, but the optimal time is the early second trimester.**
- ●Pregnant women are placed in the left lateral recumbent position to minimize uterine compression of the vena cava and the aorta.
- ●We suggest use of pneumatic compression devices for low-risk pregnant women undergoing short laparoscopic procedures for surgical problems, and low molecular weight heparin for procedures >45 minutes

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- There is no evidence that open procedures are safer than blind procedures. Modification of port sides is necessary when the uterus is significantly enlarged.
 - ●We suggest intraabdominal pressure be maintained between 8 to 12 mmHg and not exceed 15 mmHg. Maintaining intraabdominal pressure at this level helps to avoid a decrease in placental blood flow.

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- A decorative background featuring several thin, curved lines in shades of gray and green. A large, solid green speech bubble is positioned on the left side of the slide, pointing towards the text.
- ●We suggest keeping **the end-tidal carbon dioxide at 32 to 34 mmHg**, as respiratory acidosis is unlikely at this level.
 - If maternal acidosis is suspected or confirmed, then immediate hyperventilation of the mother and decreasing the intraabdominal pressure may improve placental perfusion.

باتشكر



