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Performing Endoscopy Safely in Pregnant Patients: Best Practices for the Gastroenterology Team

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ABBREVIATIONS: AU-TGA, Australian Therapeutic Goods Administration; CBD, common bile duct; EGD, esophagogastroduodenoscopy; ERCP, endoscopic retrograde cholangiopancreatography; GI, gastrointestinal; PEG, percutaneous endoscopic gastrostomy; US FDA, United States Food and Drug Administration; VC, inferior vena cava

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INTRODUCTION

Approximately 0.4% of endoscopic procedures are performed during gestation (1). Gastroenterologists must be able to offer safe and effective endoscopy for pregnant patients, while keeping in mind potential risks and complications. The purpose of this review was to summarize key periprocedural considerations when caring for pregnant patients requiring gastrointestinal (GI) endoscopy, and to propose best practice recommendations (Table 1), which represent a synthesis of available guidelines, literature, and the clinical experience of the authors.

What are the potential risks of an endoscopic procedure during pregnancy?

Data on maternal and fetal risks of GI endoscopy are sparse, and therefore, specific, absolute risks are difficult to quantify. One of the largest published population-based cohort studies reported that exposure to any endoscopy during pregnancy was associated with a slightly increased risk of preterm birth and small size for gestational age but with no increased risk of stillbirth or fetal congenital malformations. Importantly, there was notable residual confounding in the study; it is unclear whether the observed risks stemmed from the endoscopic procedure itself or the disease state which necessitated the procedure (2). Drawing from both physiological considerations and the available literature, Table 2 summarizes the potential risks of endoscopic procedures specific to pregnancy.

Best practice recommendations for endoscopy during pregnancy

Although adverse pregnancy outcomes related to GI endoscopy seem to be extremely rare, gastroenterologists should take a methodical approach toward preprocedural, procedural, and postprocedural management for GI endoscopy in the pregnant patient (Table 1).

PREPROCEDURAL CONSIDERATIONS

Indication and timing

Although elective endoscopic procedures may be postponed until postpartum, certain conditions require more urgent endoscopic management (Figure 1). When triaging endoscopy in pregnancy, the trade-off between the risks and benefits of intervening endoscopically, compared with watchful waiting and/or less invasive alternatives to GI endoscopy, must be carefully balanced and should align with individuals' values and preferences.

Contraindications

Pregnancy-related contraindications for endoscopy include imminent delivery or ruptured membranes and obstetric complications such as placental abruption and eclampsia (6).

Informed consent alterations

Perhaps most importantly, the discussion around consent should acknowledge that both the disease state and any invasive procedure may involve difficult-to-quantify risks during pregnancy. Proceeding with any invasive procedure during pregnancy is a balancing act requiring judgment on the part of the medical team and detailed discussion of the potential complications (Table 2) in a manner that establishes trust between providers, patient, and family.

Naturally, any adverse outcome to the fetus can be life-altering for the patient. Therefore, even though the prevalence of risks to the fetus are unclear and with only scant data (case reports, small retrospective studies), patients should be counseled on these

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Table 1. Best Practice Recommendations for GI endoscopy in the Pregnant Patient

Preprocedural considerations
1. Provide alternatives to the endoscopic intervention as an option whenever available
2. Review indications and triage cases as elective, nonemergent, or emergent
3. Postpone elective endoscopy procedures until postpartum
4. Involve multidisciplinary team in planning nonemergent and urgent endoscopy procedures
5. Incorporate potential benefits and risks to the mother and fetus into informed consent
Procedural considerations[a]
6. Adopt an experienced, team-based approach
7. Position patients appropriately (Figure 2)
8. For colonoscopies, consider underwater insertion and avoid abdominal pressure
9. For electrosurgical interventions, use bipolar cautery device(s) over monopolar cautery when possible; otherwise, ensure appropriate grounding pad placement (right thorax/right shoulder/right arm)
10. Practice caution with use of epinephrine injection; favoring mechanical measures of hemostasis (bipolar cautery and hemoclips) when feasible
11. For endoscopic retrograde cholangiopancreatography, use established, standard techniques for biliary cannulation over novel techniques that may prolong procedure time
12. For GI procedures requiring fluoroscopy, reduce radiation exposure to the minimum required to complete the procedure[b]
Postprocedure considerations
13. An obstetrician should be available to direct fetal monitoring and any intervention for fetal indications
14. Prior to 24 wk gestation, fetal heart rate confirmation by Doppler should occur
15. After 24 wk gestation, electronic fetal heart and uterine contraction monitoring should occur after the procedure

GI, gastrointestinal.
[a]For additional resources, please refer to Supplementary Table 1 (http://links.lww.com/AJG/D694).
[b]For fluoroscopy best practices, please refer to Table 4.

theoretical, rare risks including premature labor, stillbirth, spontaneous abortion, fetal growth restriction, and congenital malformations among others (7).

Preoperative consultations

Multidisciplinary triaging of pregnant patients in need of endoscopy by the gastroenterologist should also include, at minimum, an obstetrician or maternal-fetal medicine specialist and an anesthesiologist with experience in maternal-fetal care. Obstetricians will assess the maternal and fetus current risk status and implement fetal monitoring preprocedure and postprocedure when appropriate. The aims of anesthesia management are to ensure maternal safety and comfort and to not affect the current pregnant state. Physiologic changes of pregnancy that must be accounted for by the anesthesiologist include airway swelling, increased minute ventilation with decreased functional residual capacity (causing decreased apnea time to desaturation), and cephalad displacement of the stomach with reduced esophageal sphincter tone (causing increased risk of aspiration). Commonly used sedatives and their teratogenic potential are summarized in Table 3; small doses of short-acting sedatives are generally considered safe. We refer to Obiyo et al (8) for a thorough review of anesthetic considerations in the pregnant patient.

Periprocedural medications

Table 3 summarizes the relevant medications for endoscopists. We highlight that among bowel purgatives, polyethylene glycol is typically first choice, and among antibiotics, penicillin, cephalexin, metronidazole, and ciprofloxacin are generally reasonable during pregnancy. Nonsteroidal anti-inflammatory drugs may be considered in the first trimester despite an associated risk of miscarriage and malformations; however, they should be avoided after 20 weeks gestation because of the risk of premature closure of the fetal ductus arteriosus, oligohydramnios, and neonatal renal impairment (9). Rectal indomethacin has important potential benefits for endoscopic retrograde cholangiopancreatography (ERCP), and therefore, administration should be considered on a case-by-case basis, potentially incorporating procedural factors (difficult cannulation, pancreatic duct injection) that may lead to higher pancreatitis risk. A low threshold should be considered for other prophylactic measures such as pancreatic duct placement and postprocedural hydration.

PROCEDURAL CONSIDERATIONS

Any endoscopic procedure in a pregnant patient should be performed by an experienced endoscopist, with an experienced nurse and endoscopy technician. Key aims include minimizing procedural time and cautery and, for fluoroscopy-supported procedures, minimizing radiation time. In ERCP, we strongly favor using traditional cannulation techniques and brief pulses of fluoroscopy when necessary, vs attempts at using novel, "fluoroscopy-free" techniques that may prolong procedure time, and which might inadvertently increase other procedural risks. These latter approaches are commendable and worthy of investigation but should not yet be considered standard of care.

Patient positioning

For pregnant patients undergoing esophagogastroduodenoscopy and colonoscopy, the left lateral position is appropriate.

Table 2. Maternal-fetal risks to consider during endoscopy

	Maternal risks	Fetal risks
Oversedation	Hypotension Hypoventilation Hypoxia	Hypoxia and hypoperfusion; fetal acidosis
Bronchospasm	Hypoventilation Hypoxia	Hypoxia and hypoperfusion; fetal acidosis
Aspiration[a]	Aspiration pneumonia and hypoxia	Hypoxia and hypoperfusion; fetal acidosis
Radiation (ERCP)[b]		*Estimated conceptus dose in ERCPs for nonpregnant patients = 3.4–55.9 mGy* (3) <50 mGy (>40 abdominal X-rays) = No consequence ≥100 mGy neurodevelopmental effects, fetal cancer risk, congenital anomalies, growth restriction, microcephaly
Supine position	Vena caval/aortic compression - > hypoperfusion, hypotension	Vena caval/aortic compression - > hypoperfusion
Medications		Teratogenicity
Contrast		Hypothyroidism
Electrocautery		Amniotic fluid conduct electrical current to fetus - > acute fetal stress
Dehydration	Hypotension	Hypoperfusion
Abdominal compression techniques	Uterine compression/uterine trauma	Premature labor
Procedure- specific complications	Sepsis, perforation, peritonitis, pancreatitis[c], GI bleeding	Premature labor; stillbirth/neonatal death

ERCP, endoscopic retrograde cholangiopancreatography; GI, gastrointestinal.
[a]Risk of maternal aspiration is higher in pregnancy because of increased intra-abdominal pressure and relaxation of the lower esophageal sphincter due to progesterone and estrogen.
[b]These risks are general risks from radiation, may vary with gestational period and in ERCP, should be near zero given current data with the level of radiation exposure from fluoroscopy in ERCP.
[c]There is a higher risk of pancreatitis postendoscopic retrograde cholangiopancreatography (ERCP; adjusted odds ratio of 2.8) (4).

Procedures, such as an ERCP, are usually performed in either prone or supine positions in nonpregnant patients. However, beyond 20 weeks of gestation, a supine position must be avoided to prevent compression of the vena cava and/or aorta (maternal hypotension and reduced placental perfusion). The prone position may also be difficult in late trimesters because of the risk of inferior vena cava compression (less so than supine) and patient discomfort. Therefore, performing any endoscopic procedure is best with the patient in a left lateral decubitus position or with a left pelvic tilt (Figure 2).

Abdominal pressure

External abdominal pressure should be avoided, if possible. If it is necessary, the pressure should be away from the uterus. If there is a redundant colon, underwater insertion may assist achieving cecal intubation while avoiding abdominal pressure.

Electrosurgery

Amniotic fluid has been shown to conduct electrical current to the fetus, although the effect on the fetus is unclear. Several ways to reduce risks of electrical conduction to the fetus include (i) using bipolar electrocautery instead of monopolar, (ii) placing the grounding pad in a position whereby the uterus is not between the electrocautery catheter and the grounding pad, and (iii) minimizing time and voltage of electrocautery use (6).

Intraoperative injections

Endoscopic procedures may require the injection of different compounds (Table 2). Methylene blue and epinephrine are contraindicated because of teratogenicity, although in certain scenarios, the benefit of epinephrine injection may outweigh the risk (7). There is no evidence to avoid contrast during ERCP in pregnancy, despite a theoretical risk of hypothyroidism.

Radiation

Radiation exposure is generally of concern for both physicians and for pregnant patients. It is critical to recognize that radiation exposure during modern ERCP is generally far lower than the expected threshold for fetal risk; a dose of 100 mGy is generally considered the threshold for fetal risk, and exposure of <50 mgy is not generally believed to cause any measurable risk to the fetus (10,11). Most modern ERCP can be performed using well under 50 mGy exposure, and a typical brief ERCP (with care taken to intentionally minimize prolonged exposure, avoiding "hard shots" etc) can generally be performed with just a few seconds of fluoroscopy exposure, often under 10–15 mGy. Information regarding the total radiation dose should be provided to the patient within the postprocedural report.

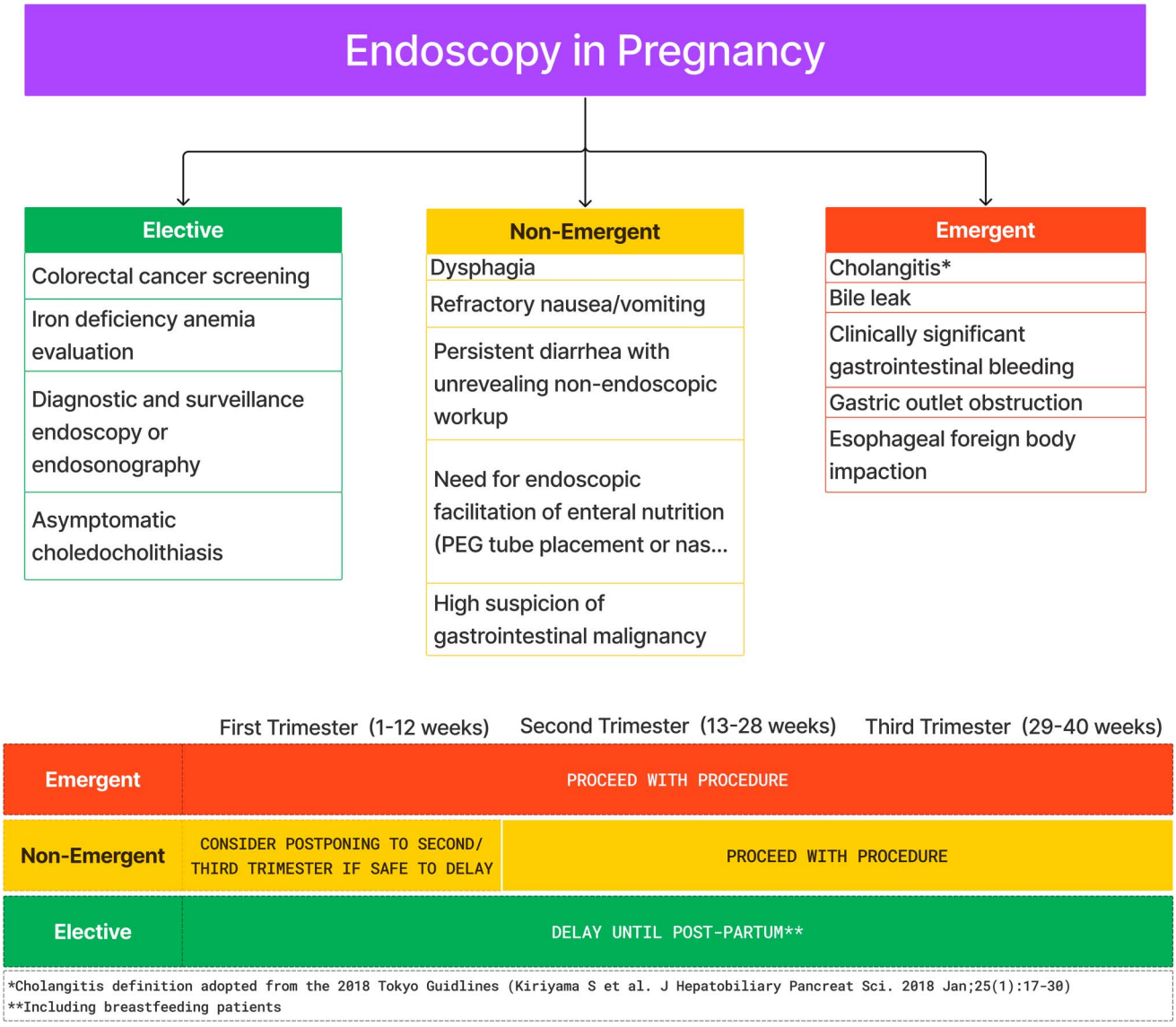

Figure 1. Timing of endoscopy in pregnancy. *Cholangitis definition adopted from the 2018 Tokyo Guidelines (5). **Breastfeeding should not deter endoscopy if indicated.

Data from small case series have shown that for pregnant patients who underwent ERCP, the mean fluoroscopy time was 0.14 minutes (range 0–1 minute); the estimated fetal radiation exposure ranged from <0.001 mGy to 1.8 mGy (12,13). As expected, fluoroscopy time is associated with the degree of radiation exposure (12,13). There are many methods to reduce the use of fluoroscopy as described in Table 4 Reassuringly, a study of long-term follow-up (up to mean age of 11.08 years) in 24 pregnant patients with ERCP did not demonstrate any developmental delays, poor school performance, or childhood cancers (14).

Most expert radiology societies have recommended abandoning patient shielding in all scenarios, including for pregnant patients. Using shielding in pregnant patients is a legacy practice which should be discontinued, as most radiation exposure outside the field of view occurs because of "internal scatter" that is not altered by shields. Furthermore, shields can interfere with the automatic exposure control of modern fluoroscopy systems, potentially increasing radiation dose (15).

POSTPROCEDURE CONSIDERATIONS

Monitoring patients for an adequate period post-postprocedurally is important, with early management of any postprocedural complications. An obstetrician should be available to direct fetal monitoring and any intervention for fetal indications.

SUMMARY

Despite the potential anxieties and uncertainties around providing endoscopic care to pregnant patients, it is critical for gastroenterologists to be informed and confident regarding strategies to optimize the safety of the pregnant patient, and to minimize the risk of adverse pregnancy outcomes related to GI endoscopy. When gastroenterologists are consulted to evaluate the need for GI endoscopy in pregnant patients, a proactive, multidisciplinary approach—incorporating gastroenterology, obstetrics, and anesthesia teams—provides the optimal framework for ensuring a safe and successful outcome.

Table 3. Pregnancy and fetal risks categories of commonly used medications in endoscopy[a]

Drug	US-FDA/AU-TGA category	TERIS category	
		Magnitude of teratogenic risk to child born after exposure during gestation	Quality and quantity of data on which risk estimate is based
Prokinetics			
Metoclopramide	NA/A	None	Fair to good
Erythromycin	B/A	None to minimal	Fair to good
Antibiotics			
Ciprofloxacin	C/B3	Unlikely	Limited to fair
Penicillin	B/A	None	Good to excellent
Gentamicin	D/D	Undetermined	Limited
Cephalexin	B/A	Unlikely	Limited to fair
Cefazolin	B/B1	Undetermined	Limited
Clarithromycin	C/B3	Unlikely	Fair
Azithromycin	NA/B1	None to minimal	Fair
Ertapenem	NA/B3	Undetermined	None
Vancomycin	C/B2	Undetermined	Very limited
Sulfamethoxazole/Trimethoprim	D/C	Small to moderate	Good
Clindamycin	B/A	Undetermined	Limited
Metronidazole	B/B2	None to minimal	Limited to fair
Antiacid therapy			
Pantoprazole	B/B3	Unlikely	Limited to fair
Omeprazole	C/B3	Unlikely	Fair to good
Rabeprazole	C/B1	Undetermined	Limited
Vonoprazan	NA/NA	Undetermined	Very limited
Famotidine	B/B1	Unlikely	Limited to fair
Sucralfate	B/B1	Undetermined	Very limited
Bismuth subsalicylate	C/NA	Undetermined	Limited
Bowel preparation for colonoscopy			
Polyethylene glycol	C	Undetermined	Very limited
Sodium phosphate[b]	C	Undetermined	None
Post-ERCP pancreatitis prophylaxis			
Indomethacin	C/C	Unlikely	Limited to fair
Sedatives commonly used in moderate sedation			
Fentanyl	C/C	Undetermined	Limited
Midazolam	D/C	Undetermined	Very limited
Ketamine	C/B3	Undetermined	Very limited
Intraprocedure injections			
Methylene blue	C	Intra-amniotic injection: Moderate–high Systemic use: Undetermined Topical use: Undetermined	Intra-amniotic injection: Good Systemic use: Very limited Topical use: Very limited
Epinephrine	C	Unlikely	Fair

Table 3. (*continued*)

Drug	US-FDA/AU-TGA category	TERIS category	
		Magnitude of teratogenic risk to child born after exposure during gestation	Quality and quantity of data on which risk estimate is based
Glucagon	B	NA	NA
Iohexol	Not assigned	Undetermined	Very limited

US FDA Pregnancy categories: A = studies in pregnant women have not demonstrated risk to fetus in any trimester; B = animal studies have not demonstrated risk to fetus and no adequate studies in pregnant women, OR animal studies have shown adverse effects but studies in pregnant women have not demonstrated a risk; C = studies in animals have shown harm to the fetus but there are no studies in pregnant women or studies in pregnant women not available; D = there is evidence of human fetal risk, but potential benefits may outweigh risks in some situations; X = studies in animals or humans have demonstrated fetal abnormalities or risks, hence risks outweigh any potential benefits; AU TGA Pregnancy categories: A = drugs taken by large number of pregnant women without increase in malformation or frequency of harmful effects on the fetus; B1 = drugs taken by only a limited number of pregnant women without increase in frequency of malformation or other harmful effects on the fetus. Studies in animals have not shown increased fetal damage; B2 = drugs taken by only a limited number of pregnant women without an increase in frequency of malformation or harmful effects on the fetus. Studies in animals are inadequate or lacking, but no evidence of increased fetal damage in available data; B3 = drugs taken by only a limited number of pregnant women without increase in frequency of malformation or other harmful effects on the fetus. Studies in animals have shown evidence of increased occurrence of fetal damage, significance uncertain in humans; C = drugs have caused or suspected of causing harmful effects on the human fetus or neonate without causing malformations. These effects may be reversible; D = drugs have caused, expected to have caused or may be expected to cause in increased incidence of human fetal malformation or irreversible damage; X = drugs have such high risk of causing permanent damage to the fetus that they should never be used in pregnancy (or if possibility of pregnancy).

AU-TGA, Australian Therapeutic Goods Administration; ERCP, endoscopic retrograde cholangiopancreatography; NA, not applicable; TERIS, Teratogen Information System; US-FDA, United States Food and Drug Administration.

[a]To obtain up-to-date information on teratogenicity, we suggest visiting https://terisweb.deohs.washington.edu. FDA categorization is subject to change with emergence of new evidence.

[b]Sodium phosphate preparations may cause fluid shifts and electrolyte imbalance, therefore use with caution.

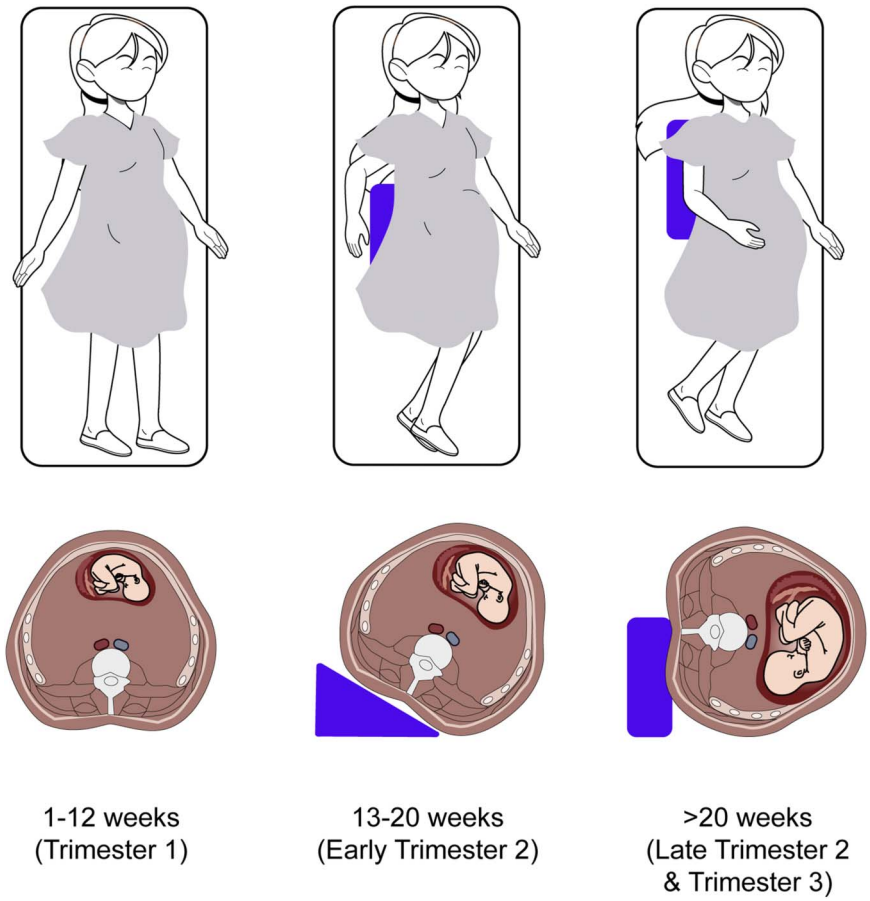

Figure 2. Positioning the pregnant patient for an endoscopic retrograde cholangiopancreatography (**a**) in Trimester 1, supine position is appropriate as it optimizes the cholangiogram and reduces radiation to the fetus (**b**) in Trimester 2, a left pelvic tilt is important to avoid IVC compression (**c**) after 20 weeks of gestation, left lateral position is advised, to avoid IVC compression and for patient comfort. IVC, inferior vena cava.

Table 4. ERCP/fluoroscopy best practices

1. Avoid lead shielding:
Routine lead shielding of the abdomen is a legacy practice that may degrade image quality and increase internal scatter, paradoxically raising fetal dose.
2. Use pulsed fluoroscopy ("short taps") rather than continuous fluoroscopy.
3. Minimize high-dose spot exposures:
If digital fluoroscopy is available, use "last image hold" or fluoro store features to save images.
If not available, limit spot images ("hard shots") to those essential for clinical documentation.
Always use low-dose rate settings when available.
4. Optimize fluoroscopy technique:
Keep the image intensifier as close to the patient as possible.
Use tight collimation to restrict the beam to the area of interest.
Avoid boost and magnification modes unless absolutely necessary.
When manual control is possible, use lower current (e.g., 2–4 mA) and higher voltage (75–80 kV) to reduce dose, recognizing this may reduce image contrast.
5. Use radiation-sparing cannulation techniques:
Prefer wire-guided cannulation over contrast injection.
Confirm deep biliary access by aspiration of bile or direct visualization of bile flow.
6. Consider procedural staging:
If a prolonged or complex ERCP is anticipated (e.g., large stone burden), consider temporary stenting with delayed definitive therapy postpartum.
7. Evaluate with EUS first when feasible:
A same-session EUS before ERCP may clarify the indication (e.g., stone burden and anatomy) and can help avoid unnecessary ERCP (and fluoroscopy), even in patients with recent imaging showing small CBD stones.

CBD, common bile duct; ERCP, endoscopic retrograde cholangiopancreatography.

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CONFLICTS OF INTEREST

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