Second-trimester pregnancy termination: Dilation and evacuation

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INTRODUCTION

The most common surgical technique for second-trimester termination in the United States is dilation and evacuation (D&E) [1,2]. Other surgical approaches include a variant of D&E called "intact D&E" and hysterotomy [3]. Hysterotomy is rarely used. These rare situations include when it is unsafe to dilate the cervix or induce labor, when no trained D&E provider is available, or when the patient has severe cervical stenosis or leiomyomas that completely obstruct the cervix and vagina.

The D&E procedure consists of two components:

- **Preparation –** Dilation of the cervix with osmotic, pharmacologic, and/or mechanical dilators.
- **Procedure –** Evacuation of the uterus with suction, extraction forceps, and curettage.

The D&E procedure is reviewed here. Indications, counseling, cervical preparation, and second trimester induction (medication) abortion are discussed separately.

- (See "Overview of second-trimester pregnancy termination".)
- (See "Pregnancy termination: Cervical preparation for surgical procedures".)
- (See "Second-trimester pregnancy termination: Induction (medication) termination".)

PREPROCEDURE PREPARATION

Cervical preparation — Cervical preparation with osmotic dilators (eg, laminaria japonica, Dilapan-S) and/or pharmacologic agents (eg, misoprostol, mifepristone) is performed prior to a second-trimester surgical abortion and usually occurs on the day of, or the day prior to, the procedure. If further cervical dilation is needed, this is performed with mechanical dilators (eg, Pratt, Hegar) at the beginning of the procedure. This is discussed in detail separately. (See "Pregnancy termination: Cervical preparation for surgical procedures".)

Injection to induce fetal demise — Injection of a substance to cause fetal demise prior to second-trimester surgical abortion is controversial. The advantages of this practice are that feticidal injection precludes the possibility of live birth, thereby potentially reducing emotional stress on the patient, and also allowing the surgeon to minimize concerns regarding compliance with legislation that penalizes uterine evacuation in which portions of the fetus are removed prior to demise [4]. In addition, it has been proposed that fetal demise makes the procedure technically easier by inducing fetal maceration and cervical priming, but this has not been scientifically demonstrated. Many clinicians use such

injections before all second-trimester surgical abortions, while others use them only in those cases in which they consider this to have a benefit for the patient.

The benefits of feticidal injection to the patient remain unproven. Two randomized trials arrived at conflicting results regarding whether injection of digoxin prior to D&E resulted in an increased rate of extramural birth (spontaneous delivery of the fetus prior to the procedure) or an increased risk of infection [5,6]. Extramural birth sometimes occurs prior to demise, and this, along with the unplanned nature of this event, may potentially cause distress to the patient. In addition, feticidal injection has been associated with an increased rate of nausea or pelvic pain [4]. A report by the Society of Family Planning found insufficient evidence to support pre-D&E feticidal injection [7]. Some experts have questioned the ethics of adding this invasive procedure with potential risks and unproven benefits, particularly if performed principally to fulfill a legal requirement.

Given the available data and other considerations, for most patients undergoing second-trimester D&E, we suggest **not** using feticidal injection. Use of feticidal injection is a reasonable option for patients who find it emotionally reassuring and who are willing to accept a potential increased risk of extramural birth, infection, and other adverse effects (nausea or pelvic pain).

The technique and choice of agents used for induced fetal demise are discussed in detail separately. (See "Induced fetal demise".)

Anesthesia — Second-trimester D&E is typically performed using a paracervical block and intravenous conscious sedation. Anesthesia for D&E is discussed separately.

Prophylactic antibiotics

- In our practice, we administer doxycycline 200 mg orally one hour prior to uterine evacuation. Other providers prefer a single dose of azithromycin 500 mg orally at time of dilator placement. Because of its long half-life, a second dose of azithromycin is only given if the surgical abortion is performed >24 hours after the initial dose of antibiotics.

- If dilators are **not** used prior to the surgical abortion, various acceptable antibiotic regimens are available (table 1).

A more thorough discussion regarding antibiotic prophylaxis is provided elsewhere. (See "First-trimester pregnancy termination: Uterine aspiration", section on 'Antibiotic prophylaxis' and "Pregnancy termination: Cervical preparation for surgical procedures", section on 'Procedure'.)

Pregnancy termination procedures do not require antibiotic prophylaxis for bacterial endocarditis, in the absence of high-risk conditions. (See "Antimicrobial prophylaxis for the prevention of bacterial endocarditis", section on 'Clinical approach'.)

Thromboprophylaxis — Thromboprophylaxis is not typically required for second-trimester D&E. Indications for thromboprophylaxis for surgical procedures are discussed separately. (See "Prevention of venous thromboembolic disease in adult nonorthopedic surgical patients".)

PROCEDURE

Speculum — A Graves or Pederson speculum is typically used, but in some cases, these speculums make the D&E procedure challenging to accomplish because they prevent introduction of extraction forceps beyond the hub of the speculum. Alternatives include using a side-open speculum that provides additional space for extraction, doing the

procedure without a speculum (using care to visualize the cervix with each pass of the forceps) or using a short-bladed speculum (eg, Klopfer speculum). Our choice of speculum varies depending on the patient's anatomy and body habitus.

Cervical dilation — Based upon the diameter of most forceps used for D&E, the minimum dilation required ranges from 14 to 19 mm (42 to 57 French) and depends on gestational age [8]. Sufficient cervical dilation decreases the risk of morbidity, including cervical injury and uterine perforation [9-11].

In general, the extraction forceps should easily traverse the cervix without resistance. In our practice, we use Sopher forceps (picture 1) for pregnancies through 16 to 18 weeks' gestational size. After 18 weeks of gestation, we prefer the larger Bierer forceps (picture 2).

The procedure and instrumentation for mechanical cervical dilation is described separately. (See "Pregnancy termination: Cervical preparation for surgical procedures", section on 'Role of mechanical dilation'.)

Uterine evacuation — The D&E procedure for evacuation of the fetus and placenta is performed using a combination of suction, extraction with forceps, and curettage.

After adequate cervical dilation is achieved, suction curettage is performed. Suction cannulae up to 16 mm permit evacuation of gestations through approximately 16 to 18 weeks. Operators perform suction in later gestations to remove amniotic fluid prior to fetal extraction The procedure for suction curettage is described separately. (See "First-trimester pregnancy termination: Uterine aspiration".)

If a cannula smaller than 16 mm is used or the gestational age is greater than 16 to 18 weeks, suction curettage is followed by use of fetal extractor forceps (eg, Hern, Van Lith, Sopher, or Bierer forceps) to remove fetal parts (picture 1 and picture 2). Procedures that require use of large forceps should be performed by an experienced surgeon.

Techniques that facilitate the procedure and help to avoid complications include:

- Ultrasound guidance can provide information about the uterine anatomy and the location of fetal parts. This may facilitate technically challenging extractions and may decrease the risk of uterine perforation [12]. Providers should consider using ultrasound in patients with obesity or uterine anomalies, when training inexperienced providers, and in any case in which the provider experiences difficulty with evacuation. One study of over 4500 second-trimester surgical abortions found no increased risk of complications in patients with obesity [13].
- Digital examination of the uterine cavity can help to locate fetal parts, which helps to correctly place the extraction forceps.
- Most surgeons find they have to open the extraction forceps wider than anticipated, particularly to encircle the calvaria of a later gestation.
- The pregnant uterus curves somewhat anteriorly. Some forceps, such as the Hern, angle the jaws of the instrument anteriorly to help correct for the natural location of fetal parts.
- Surgeons must be very careful to avoid pushing fetal parts with the forceps since this may push them deeper into the fundus and even through the uterine wall, causing uterine perforation.
- The fetal parts should be brought down to the lower uterine segment for disarticulation. This prevents operating in close proximity to the thinner and more easily perforated uterine fundus. Caution should be employed since bony spicules exposed during fetal disarticulation can perforate the uterine walls and abrade the cervix.

- The optimal approach is to operate in the midline. More lateral placement of forceps may result in a lateral uterine perforation with potential involvement of the uterine vessels.
- Surgeons should attempt to reduce the number of passes of extraction forceps since this reduces the opportunity to perforate the uterus or abrade the cervix. When possible, the fetus should be removed as intact as possible, which minimizes the number of passes and provides greater assurance of complete extraction.
- Surgeons may utilize the Hanson maneuver to improve fetal localization [14]. With the extraction forceps placed in the lower uterine cavity, surgeons places their other hand on the patient's abdominal wall to localize the forceps in relation to fetal parts and to help prevent uterine perforation.

Both the fetus and placenta must be entirely removed. Some surgeons prefer to remove the placenta after the fetus to avoid disruption of the placental bed, but this is not always possible. The placenta has a characteristic soft consistency that experienced surgeons can discern with extractors.

Following extraction of fetal and placental tissue, most surgeons finish the D&E by curetting the uterine lining with a suction cannula. This permits removal of most of any remaining placental fragments. Some surgeons then perform a "curette check," using a sharp curette to gently feel for any retained parts and confirm the texture of an empty uterus. In our experience, this maneuver is not necessary and has the potential to needlessly increase pain, as well as the risk of uterine perforation [15,16].

Intact dilation and evacuation — A variant of D&E is intact D&E. With this technique, the fetus is removed intact or nearly intact through the cervix [17,18]. After achieving sufficient cervical dilation with osmotic dilators, surgeons use extraction forceps to deliver a breech fetus until the calvaria is lodged above the internal os. The remainder of the fetus is delivered intact following decompression of the calvaria, often by suctioning intracranial contents. If the fetus is in vertex presentation, the surgeon can make an incision in the calvaria, suction intracranial contents, and collapse the calvaria with extraction forceps. The remainder of the fetus will subsequently deliver intact.

The potential advantages of intact D&E compared with standard D&E include:

- The likelihood of uterine perforation and cervical abrasion may be decreased because the technique minimizes the number of instrumental passes and permits direct visualization within the vagina.
- Because the fetus is removed intact, it might also permit superior morphologic evaluation to further clarify prenatal diagnosis, although pathologic evaluation can also be performed on non-intact specimens [19].

The only study comparing intact D&E with standard D&E was a retrospective study of 383 patients who underwent surgical abortion at ≥20 weeks of gestation [20]. There was no difference in estimated blood loss or operative duration between the intact extraction and disarticulation groups. The overall rate of complications was 5 percent in both groups. Three patients in the D&E group required admission to a surgical intensive care unit (complications included amniotic fluid embolus, sepsis, pulmonary embolus, perforation of hysterotomy scar); however, there were insufficient data to detect a difference in the risk of major complications.

In the United States, the Partial-Birth Abortion Act of 2003 criminalizes some variants of D&E and provides no legal exception for cases performed to protect maternal health. Clinicians should consult the provisions of the law if they intend to perform an intact extraction, and some experts advise use of preoperative feticidal injection.

Use of uterotonics and vasoconstrictive agents — The routine use of perioperative or postoperative uterotonic agents (eg, oxytocin, methylergonovine) is a subject of debate. Although many providers, including the author of this topic, routinely use uterotonics and vasoconstrictive agents, Society of Family Planning guidelines advised that there is no compelling evidence justifying their routine use [21,22]. The risk of perioperative hemorrhage increases with

advancing gestational age and is most commonly the result of uterine atony. The uterus becomes increasingly responsive to oxytocin after 20 weeks of gestation, increasing its efficacy in treating hemorrhage.

Options for use of prophylactic uterotonic or vasoconstrictive agents include:

- Paracervical injection at the time the paracervical block is administered. Dilute oxytocin or dilute vasopressin injected during deep paracervical injection may help control blood loss [23,24]. Paracervical injection of vasopressin was found to significantly reduce blood loss in a randomized trial [23]. In our practice, we use a solution of vasopressin 5 units in 20 mL of 1 percent lidocaine and administer 10 mL of the solution on each side of the cervix.

- In our practice, we administer intravenous oxytocin at the time of speculum placement for evacuations >18 weeks gestation [25]. Some surgeons initiate uterotonics only after evacuation based on a concern of entrapping fetal material as the uterus contracts.

Assessment for retained products of conception — At the end of the procedure, the surgeon should inventory evacuated contents and account for the major fetal parts (calvaria, thorax, pelvis, four extremities). The most important measure of complete evacuation is the clinical assessment of an experienced surgeon who has inspected evacuated products.

Pelvic ultrasound may also be helpful. This is particularly the case when clinicians evacuate anomalous pregnancies or pregnancies in which fetal demise results in substantial maceration of fetal anatomy. Unfortunately, small blood clots rapidly accumulate immediately after D&E, which may obscure some fetal parts or mimic the appearance of a retained placenta.

OUTCOME AND COMPLICATIONS

Second-trimester surgical abortion is a safe and effective procedure. Uterine evacuation is completed in a single procedure for most patients. In general, less than 5 percent of patients have retained products of conception or a complication. Complications of D&E, in addition to retained products of conception, include cervical laceration, uterine perforation, infection, and hemorrhage [8].

Retained products of conception — Retained products of conception are found following less than 1 percent of second-trimester D&E procedures [26,27]. The evaluation and management of retained products of conception is discussed separately. (See "Retained products of conception in the first half of pregnancy".)

Uterine perforation — Uterine perforation is potentially one of the most serious complications of surgical abortion and occurs in less than 1 percent of second-trimester D&E procedures [9,28]. In some cases, a perforation results in hemorrhage or damage to the bowel or bladder or to large vessels. Factors that increase the risk of uterine perforation include increasing gestational age, cervical abnormalities, multiparity, and an inexperienced provider. Perforations in the second trimester are more likely to involve injury to bowel or other structures than those occurring in the first trimester [10,29]. The evaluation and management of uterine perforation is discussed separately. (See "Uterine perforation during gynecologic procedures".)

Cervical laceration — A cervical laceration occurs in up to 3 percent of second-trimester abortions, whether performed by D&E or medical abortion [30]. Surgeons can reduce the frequency of cervical laceration by using cervical preparation and by appropriate technique with mechanical dilators. (See "Pregnancy termination: Cervical preparation for surgical procedures".)

Most cervical lacerations are small and require no intervention, provided they remain hemostatic. Treatment options for bleeding lacerations include clamp compression for several minutes, application of ferric subsulfate solution (Monsel solution) or suturing. Cervical lacerations of the internal os, also known as "cervical fractures," can dissect laterally into the paracervical space, causing severe hemorrhage or hematoma formation. Surgeons should suspect high cervical injury when bleeding continues postoperatively despite preservation of normal uterine tone. Application of pressure and ferric subsulfate solution controls many of these injuries. Balloon tamponade and angiographic embolization might also help control bleeding from severe high cervical tears [31]. (See 'Cervical preparation' above.)

Infection — Infection rates following second-trimester abortion vary up to as high as 4 percent. Definitions of postabortion infection vary, as do diagnostic criteria for postabortal endometritis [9,28,32]. Use of prophylactic antibiotics, as recommended above, reduces rates of infection to less than 1 percent [33]. There are no data regarding the rates of infection in surgical abortion compared with medical induction abortion regimens. (See 'Prophylactic antibiotics' above.)

The management of postabortal endometritis is similar to that for postpartum endometritis. (See "Postpartum endometritis".)

Hemorrhage — Definitions of postabortion hemorrhage vary. Although many investigators have previously defined hemorrhage as an estimated blood loss of ≥200 mL, the Society of Family Planning definition is either ≥500 mL or a surrogate marker (eg, need for transfusion) [21]. Estimates of the incidence of postabortion hemorrhage vary. Rates reported in published series range from 0 to 3 cases/1000 first-trimester procedures versus 0.9 to 10/1000 cases of second-trimester abortion [21]. There are no data regarding the rates of hemorrhage in surgical compared with induction abortion. However, blood loss is higher in induction procedures [21,34,35].

Hemorrhage can result from a variety of causes, including uterine atony, retained products of conception, coagulopathy, abnormal placentation, and uterine or cervical injury. Uterine atony is the most common cause of hemorrhage following D&E and complicates approximately 2 percent of D&E procedures [36].

Prior cesarean section is also associated with an increased risk of postabortion hemorrhage. This increase in risk is seen after one cesarean (1.8 times higher in one study [13]), and notably was 7.4 times higher after two or more cesarean deliveries in another study [36]. Operators confronting patients with a history of prior cesarean should consider taking perioperative measures to reduce the likelihood of hemorrhage, including use of vasopressin in the paracervical block and utilization of preoperative cervical ripening agents. They should also anticipate hemorrhage by assuring the presence of pharmacologic and other agents necessary to treat postabortion hemorrhage when it arises. (See "Overview of postpartum hemorrhage".)

Mortality — From 2004 to 2008, the United States Centers for Disease Control and Prevention reported a mortality rate of 0.64 per 100,000 legal induced abortions; these data are for first- and second-trimester abortions, and the majority of abortions were D&E procedures [37]. The strongest risk factor for surgical abortion-related mortality is increasing gestational age. The risk of death from surgical abortion increases roughly 38 percent per week of gestation after eight weeks [38].

FOLLOW-UP

Follow-up for second-trimester induction abortion is the same as for surgical abortion. This is discussed in detail separately. (See "Overview of second-trimester pregnancy termination", section on 'Follow-up'.)

FUTURE OBSTETRIC OUTCOMES

Study results vary regarding D&E and risks to subsequent pregnancy. Some studies have found an increased risk of cervical insufficiency with rapid mechanical dilation or an increasing number of abortion procedures [39].

However, in a retrospective review of 600 patients undergoing D&E between 14 and 24 weeks, the overall rate of preterm birth in subsequent pregnancies was less than the overall rate of preterm birth for the general United States population (6.5 versus 12.5 percent) [40]. Similarly, a study that compared subsequent pregnancy outcomes among 317 patients undergoing second-trimester D&E with 170 matched controls found that patients with a history of prior D&E delivered slightly earlier in gestation than controls (38.9 versus 39.5 weeks of gestation); this was statistically significant, but clinical significance is uncertain. There was no statistically significant difference in birth weight, spontaneous preterm delivery, abnormal placentation, and overall rates of perinatal complications [41]. A recent study demonstrated a higher rate of preterm birth after second-trimester induction abortion compared with D&E [42].

SPECIAL CIRCUMSTANCES

Management of patients with special issues of concern (eg, uterine anomalies, low-lying placenta, multiple gestation) is discussed separately. (See "Overview of second-trimester pregnancy termination", section on 'Special circumstances'.)

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Pregnancy termination".)

INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5th to 6th grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10th to 12th grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or e-mail these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient info" and the keyword(s) of interest.)

- Basics topic (see "Patient education: Abortion (The Basics)")
- Beyond the Basics topic (see "Patient education: Abortion (pregnancy termination) (Beyond the Basics)")

SUMMARY AND RECOMMENDATIONS

- The most common surgical technique for second-trimester termination in the United States is dilation and evacuation (D&E). Other surgical approaches include intact D&E, which is a variant of D&E, and hysterotomy. Hysterotomy is rarely used except when it is unsafe to dilate the cervix or induce labor. (See 'Introduction' above.)
- The D&E procedure consists of two components: (1) preparation and dilation of the cervix with osmotic, pharmacologic, and/or mechanical dilators, and (2) evacuation of the uterus with suction, extraction forceps, and

curettage. (See 'Introduction' above.)

- For most patients undergoing second-trimester D&E, we suggest not using preprocedure feticide (**Grade 2B**). Use of feticidal injection is a reasonable option for patients who place a high value on preprocedure feticidal injection and who are willing to accept a potential increased risk of extramural birth, infection, and other adverse effects (nausea or pelvic pain). (See 'Injection to induce fetal demise' above.)

- To decrease the risk of infection, we give doxycycline 200 mg orally one hour prior to uterine evacuation. Other providers give azithromycin 500 mg orally once when dilators are placed. If dilators are **not** used prior to the surgical abortion, various acceptable antibiotic regimens are available (table 1).

- The D&E procedure for evacuation of the fetus and placenta is performed using a combination of suction, extraction with forceps, and curettage. (See 'Uterine evacuation' above.)

- The routine use of perioperative or postoperative uterotonic agents (eg, oxytocin, methylergonovine) or vasoconstrictive agents is a subject of debate. In our practice, we use a paracervical injection of vasopressin during our paracervical block with lidocaine to help control blood loss and administer intravenous oxytocin beginning at the time of speculum placement for all evacuations >18 weeks gestation. (See 'Use of uterotonics and vasoconstrictive agents' above.)

- Surgeons must document completion of D&E by inspecting the products of conception for the four extremities and calvaria. Intraoperative pelvic ultrasound can assist surgeons performing D&E, particularly in a teaching setting. (See 'Assessment for retained products of conception' above.)

- In general, fewer than 5 percent of patients who undergo second-trimester D&E have retained products of conception or a complication. Potential complications of second-trimester D&E include retained products of conception, uterine perforation, cervical laceration, infection, and hemorrhage. (See 'Outcome and complications' above.)

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GRAPHICS

Antibiotic regimens prior to uterine aspiration for pregnancy loss or termination

When osmotic dilators* are NOT used:
▪ Doxycycline 200 mg orally administered as a single dose within 60 minutes prior to uterine evacuation[1-3] or
▪ Metronidazole 500 mg orally administered as a single dose within 60 minutes prior to uterine evacuation[1] or
▪ Azithromycin 500 mg orally administered as a single dose within 60 minutes prior to uterine evacuation¶[1,3]
When osmotic dilators* are used¶:
▪ Azithromycin 500 mg orally administered as a single dose at time of dilator placementΔ[1]

For additional information, refer to the appropriate UpToDate clinical topics and Lexicomp drug information monographs included within UpToDate.

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* Types of osmotic dilators include laminaria japonica and Dilapan-S.

¶ Some providers defer antibiotics at the time of dilator placement and rather administer antibiotics (eg, doxycycline 200 mg orally as a single dose) preoperatively.

Δ Because of its long half-life, a second dose of azithromycin is only given if the surgical abortion is performed >24 hours after the initial dose of antibiotics.

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Graphic 129043 Version 6.0

Sopher uterine forceps

Graphic 87448 Version 1.0

Bierer uterine forceps

Graphic 87449 Version 1.0

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