

Second-Trimester Surgical Abortion

Warren M. Hern, M.D., M.P.H., Ph.D.

Director, Boulder Abortion Clinic

Assistant Clinical Professor
Department of Obstetrics and Gynecology
University of Colorado Health Sciences Center

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From the early reports of the Joint Program for the Study of Abortion (JPSA) published in the early 1970s, the medical community learned to its surprise that surgical abortion was safer in the early second trimester of pregnancy than the more widely used induction methods.¹ Moreover, the JPSA study challenged the sacrosanct notion that a surgical abortion could not be performed at all in the period immediately following the first trimester (13 to 16 menstrual weeks). Conventional wisdom held that, following the first trimester, the physician must wait until the 16th or even 17th week of gestation, then apply an intraamniotic solution of hyperosmolar saline, for example, to induce the abortion.

Although "dilation and evacuation" ("D & E") abortions had been performed in England by Drs. Sopher, Bierer, and Finks, among others, and by Japanese physicians, it was not until the JPSA Study report was published in 1972 that this procedure was acknowledged in the United States. A 1977 report from the Centers for Disease Control confirmed the earlier JPSA findings.² In December 1976, a paper describing the use of serial multiple *Laminaria* dilation of the cervix prior to surgical evacuation was presented at the annual meeting of the Association of Planned Parenthood Physicians, although the decision to accept the paper for presentation on the program was extremely controversial. The paper was published the following year in *Advances in Planned Parenthood* as the first clinical report of D & E in the American literature.³

D & E is now accepted as the method of choice in second-trimester abortion in the United States, although the details of how this is done vary from physician to physician and from clinical institution to clinical institution. *Laminaria japonicum*

are often used, sometimes with a single application, and sometimes with multiple serial applications. Synthetic hygroscopic dilators are sometimes used in place of *Laminaria*. Misoprostol is being studied as a principal or adjunctive method of cervical dilation. Anesthesia is often administered locally; however, sometimes general anesthesia is used.

The emphasis in this chapter is on the principles of surgical technique in second-trimester abortion from 13 through 26 menstrual weeks of gestation. Whereas the lower range may not be considered by some to be in the second trimester, the principles of operating in the 13- to 14-week range may have more in common with procedures performed at a later stage than with commonly used procedures in the early first trimester. The emphasis also is on outpatient practice in a freestanding clinic or private office setting. Detailed step-by-step methods are described in specialized texts and reports.⁴⁻⁶

GENERAL PRINCIPLES OF ABORTION TECHNIQUE

The first step in any surgical procedure and the management of its complications is prevention. Good surgical techniques tend to prevent complications and should be followed for any type of surgery. These include accurate preoperative diagnosis and evaluation, a high level of operator skill, sound sterile technique, atraumatic surgical technique, thorough removal of devitalized tissue, and careful postoperative supervision and follow-up.

Careful application of these principles can eliminate most sources of complications in surgical abortion. Although many believe that complications are inevitable, the best attitude is that all

complications are preventable. Each complication must be examined to determine its source and possible means of prevention. The lessons thus derived should be applied immediately to the operating protocol.

PREOPERATIVE DIAGNOSIS AND EVALUATION

Preoperative diagnosis and evaluation of second-trimester abortion patients means answering several of the following questions:

1. What is the length of gestation or actual fetal age?
2. Is the pregnancy complicated by the presence of uterine abnormalities, multiple gestation, hydatidiform mole, or other conditions?
3. Is the pregnancy complicated by the history or presence of concurrent medical or surgical conditions such as diabetes, neurologic disorders, previous cesarean delivery, or cardiovascular disease?

OPERATOR SKILL

A high level of operator skill is at least as important in abortion as in any other surgical endeavor. Abortion is a blind procedure that is performed by touch, awareness of the nuances of sensations provided by instruments, honesty, and caution. Competent orientation in the performance of an abortion is essential, but abortion, almost more than any other operation, demands experience to develop skill. Experience that is not interpreted honestly, however, becomes the mere repetition of mistakes. Practitioners must be brutally honest with themselves to make the necessary corrections from second to second while performing the procedure.

- Did the forceps or suction tip pass through the uterine wall?
- Is the material grasped with the forceps unyielding?
- Is this material uterine wall and not fetal tissue?
- Is the patient merely agitated, or is she having a severe vasovagal episode?

Competence in other aspects of pelvic surgery learned in residency training does not assure competence in abortion. Likewise, competence in first-trimester abortion by no means assures immediate competence in second-trimester surgical technique.

Operative competence in abortion comes through observation of an experienced and highly competent practitioner, through performance of early, uncomplicated abortion under direct supervision

until confidence and smoothness are gained, and through practice.

STERILE TECHNIQUE

Sterile technique is often abandoned or neglected in some aspects of abortion care, partly because the risks of poor technique are underestimated. Although the germ theory of disease has fallen on hard times, it unquestionably has relevance to abortion technique.

Each abortion, no matter how carefully it is performed, results in a contaminated uterine cavity. Most women overcome this contamination through natural body defenses against infection; however, a more prudent point of view is that the operator must do everything possible to keep contamination to a minimum. This approach implies the use of individually sterilized specula, autoclaved instruments, face masks, and sterile gloves. The no-touch technique is essential, as is scrupulous attention to intraoperative sterile technique. Even when abortions are performed by highly experienced operators, tissue is retained often enough to require assiduous attention to this point. A clot or devitalized tissue within the uterus is a superb culture medium for bacteria.

In the early 1970s, with the advent of outpatient abortion clinics, the no-touch technique became popular with abortion practitioners. This highly useful adaptation requires that the operator, after placement of the speculum and antiseptic cleansing of the vagina, touch only the grasping end or portion of the instrument on the sterile tray. After that part of the instrument is touched, it is kept away from the tips of any instruments that remain sterile and will be placed within the uterine cavity.

A common mistake seen in ambulatory clinics is the application of sterile operating room technique to this system; the result is complete contamination. For example, surgeons trained in operating room technique are accustomed to having the vagina and perineum prepared by a nurse or operating room technician before they enter the room. The surgeon wears a sterile gown and gloves, takes a sterile speculum from the tray, places it in a position in the patient's vagina after performing a bimanual examination, and proceeds with the operation. It does not matter whether the surgeon touches the speculum after that; it is sterile. The same operator need not pay attention to how the dilators are handled, because everything is sterile. The surgeon may touch the instruments on the end or in the middle or turn them around and back again with impunity.

Now place this operator in the outpatient clinic using a no-touch technique. The speculum is sterile and wrapped in its own package. The instrument tray is opened, and it is sterile inside. The patient has not been prepared in the standard operating room manner. After a bimanual examination is performed, the operator places the sterile speculum in the vagina, using at least one gloved hand. Regardless of whether the operator uses one or two sterile gloves, the speculum is no longer sterile at this point; the perineum has not been treated with antiseptic. Suppose that the operator works in a clinic that uses sterile gloves from this point in the procedure. The operator dons sterile gloves, applies antiseptic to the vagina with a sponge forceps and gauze, and prepares to begin the procedure. Just before doing so, the operator stops to adjust the speculum with gloved hands. At that point, the only reason for keeping the gloves on would be to protect the operator from the patient's fluids; certainly, the gloves no longer serve their original function.

The no-touch technique practiced without gloves can be used in performing first-trimester abortion safely, but it is even more likely to result in contamination that endangers the patient, and it is not an option in second-trimester abortion. In outpatient second-trimester abortion, the safest combination is a strict no-touch technique practiced with sterile gloves after the completion of initial (gloved) examination and antiseptic preparation. The increasing prevalence of human immunodeficiency virus infection and acquired immune deficiency syndrome makes this practice even more necessary for the protection of both the patient and the operator.

ATRAUMATIC TECHNIQUE

One of the first principles in medicine is not to harm the patient. Surgeons of all types properly emphasize the gentle handling of tissue to minimize trauma to the patient's body. There is no reason why this excellent concept should not be pursued vigorously in abortion.

The primary source of trauma to the pelvic organs in abortion arises from perforation of the uterus and a related injury, cervical laceration. These injuries vary widely in severity and principal cause, but many must be ascribed to methods of cervical dilation. In second-trimester abortion, uterine injury often arises from the use of crushing forceps, but again, these injuries frequently can be traced to inadequate cervical dilation.

Such an obstacle to the act of emptying the uterus as the internal os requires close attention. In early

pregnancy and even beyond, the internal os generally resists dilation by force. If there is an alternative to brute strength that tears tissue in a significant number of cases, why not use it?

In every major series of surgical abortions, perforation of the uterus has been an important complication. Although perforation frequently is related to underestimation of gestational length, it is more likely to be related to uterine position and forcible dilation, especially in first-trimester abortion. The source of most perforations, forcible manual dilation, is obvious. There is an alternative to this method: dilation by means of *Laminaria* or other hygroscopic materials.⁷

Dilation of the cervix with *Laminaria* overnight or even for a few hours softens the cervix in addition to dilating it. The mechanism of this agent is incompletely understood, but it works.⁸⁻¹² The need for force in even supplemental manual dilation is reduced, the need for anesthesia is reduced, the procedure time is shorter, and wider dilation permits the easier use of instruments, such as curets, to assure uterine emptying. In second-trimester abortion, manual dilation is wholly inadequate.

In this case, atraumatic surgical technique does not mean that appropriate instruments may not be used. The curet is an indispensable instrument that, when used properly, can help to empty the uterus as no other instrument can. In addition, when handled properly, the curet is not much more likely to cause a perforation than is a flexible cannula.

The key to atraumatic use of the curet is the proper method of holding it. The instrument must be held gently between two fingers. The grip must be firm enough for control, but relaxed enough to permit the instrument to slip back through the fingers on encountering the uterine fundus or other resistance.

The use of an atraumatic tenaculum, such as the side-curve Kelly instrument with an Allis (5 × 6) tip, accompanying *Laminaria* for dilation, will virtually eliminate cervical lacerations caused by tenacula. With proper *Laminaria* dilation, the tenaculum needs to be closed only one stop, again minimizing trauma.

REMOVAL OF DEVITALIZED TISSUE

The purpose of an abortion is to empty the pregnant uterus of its contents. This principle may seem too elementary to state, but the frequency with which it is ignored requires its mention. The underlying surgical principle that is applied to abortion is thorough removal of devitalized tissue. The reputation for danger that abortion acquired in the United States, at least in the first half of the 20th century, was from

the many incomplete abortions that resulted in sepsis and death.

Modern applications of abortion technology sometimes overlook this important principle. Patients receiving amniotomies and/or medical induction in the second trimester are left to deliver the placenta on their own.

Several factors contribute to attainment of the goal of complete uterine evacuation. First, adequate dilation permits the use of appropriate instruments in second-trimester abortion. Second, routine exploration with ring forceps and curettage after second-trimester D & E abortion and removal of the placenta almost always yields tissue. The curet is a valuable tool for determining whether the uterine wall has been denuded of decidua and placental fragments. Vacuum aspiration with a large (12 mm) cannula completes the procedure.

POSTOPERATIVE CARE

Careful postoperative supervision and follow-up are important in any type of surgery. The fact that abortion patients frequently feel well within a few minutes after the abortion does not minimize the necessity of such care.

For postabortion patients, vital signs should be observed and recorded at frequent intervals, including immediately after the procedure, while the patient is on the operating table; on arrival at the recovery room; and once before departure from the recovery room.

Tissue obtained during the abortion procedure must be examined immediately, preferably by the physician. In all cases, it must be examined by the operating physician or a physician assigned to this task. The gross appearance of the tissue is far more informative for patient management than a laboratory slip obtained several days later. If the tissue is not consistent with the estimated length of gestation, the physician must evaluate the operative procedure to determine whether it was incomplete or irregular in some way. In the second trimester, it is especially important to examine the tissue for completeness including presence of the fetal calvaria, thorax, and all extremities. Placental tissue must be present in an appropriate quantity.

The single most critical observation in estimating gestational age in second-trimester abortion is fetal foot length. The gross weight of all tissue combined should also be obtained; if the fetus and placenta can be weighed separately, this should be done. A chemical balance scale can be used for optimum accuracy.

If possible, follow-up arrangements must be made with the patient before she leaves, especially if the

patient is from a distant community or cannot be contacted once she leaves. Good follow-up is the best way to prevent a minor postoperative complication from becoming major or even fatal.

SPECIAL CONSIDERATIONS IN SURGICAL ABORTION

Anesthesia

The choice of anesthesia is an important one and a subject that remains controversial among abortion service providers. The primary issue is whether general or local anesthesia is to be used for surgical abortion, as opposed to amniotomies and/or medical induction methods. The medical literature shows that local anesthesia has its risks, but most of them have to do with the inappropriate application of toxic amounts rather than inherent dangers of the local anesthetic agent itself. Conversely, the dangers of general anesthesia are more significant. There appears to be no medical justification, other than uncontrolled epilepsy, severe mental retardation, or agitated psychosis, for the use of general anesthesia in abortion. Patient comfort and physician convenience are marginal indications for general anesthesia, considering the risks involved. The degree of bleeding experienced under general anesthesia is greater, the risk of perforation is greater, and the risk of death from the aspiration of vomitus, among other factors, appears to be greater. The risk of death during abortion performed under general anesthesia is two to four times greater than under local anesthesia, and the risk of major complication is up to four times greater under general anesthesia.¹³⁻¹⁶ These risks may be even greater for second-trimester D & E abortion.

Local anesthesia offers many advantages over general anesthesia:

1. The patient is alert, responsive, and communicative both during and immediately after the procedure. She is able to report important symptoms that may signal the occurrence or onset of serious complications in time to prevent them from becoming more serious or even fatal.
2. Generally, the patient feels well and has a clear head within minutes after the procedure. This rapid recovery is an important advantage for patients who have driven long distances for the abortion and must drive home shortly after the procedure.
3. The gag reflex is not diminished under local anesthesia, whereas it is suppressed with general anesthesia. Abortion patients may have many

characteristics, but one of them is occasional difficulty in following instructions not to eat or drink anything for a fixed number of hours before the abortion procedure.

4. Patients who have had general anesthesia with previous abortions almost invariably have severe emotional problems dealing with the current abortion, in both the preoperative and operative phases. This phenomenon has become obvious and wholly predictable. For mental health reasons alone, general anesthesia may be contraindicated for abortion procedures.
5. The use of general anesthesia eliminates physician-patient interaction during the abortion and insulates the physician from the patient's emotional experience. This loss is a serious problem for physicians and may make it extremely difficult for them to relate to the emotional problems encountered by abortion patients. It does nothing to enhance the physician's empathy for the patient's dilemma or the physician's understanding of the importance of this experience to the patient.

Some surgical procedures require general anesthesia. Open heart surgery, major abdominal surgery, and major orthopedic surgery are among them; operative abortion is not.

"Conscious sedation" is another choice, in which the patient is only marginally conscious. Techniques and drugs for this procedure vary from practitioner to practitioner and from institution to institution. When conscious sedation borders on second or third stage of general anesthesia, however, the patient must be attended by an anesthesiologist or nurse anesthetist.

Dilation and Evacuation

Since the 1972 report by Bierer and Steiner,¹⁷ numerous accounts of dilation and evacuation (D & E) series have appeared in the literature.^{3,4,18-20} One of the principal controversies among advocates of the D & E method is the manner of cervical dilation. The method described by Bierer and Steiner¹⁷ and used by Barr²¹ is manual dilation under anesthesia the day before the procedure, followed by placement of a number of Laminaria sticks. The *Laminaria* dilate the cervix overnight and permit the evacuation of the uterus with large forceps. Another protocol, described best by Hanson,²² requires placement of several *Laminaria* in the cervix without manual dilation the afternoon before the abortion.

A protocol that I have adapted from the Japanese experience reported by Neubardt and Schulman²³

uses serial multiple Laminaria treatments over 2 days. Under this protocol, one or more *Laminaria* are placed in the cervix on day 1. They are removed and replaced by a larger number on day 2, and the uterus is evacuated with forceps on day 3 under paracervical block anesthesia. I use several variations of this method. Supplemental manual dilation is performed with oversized Pratt dilators or special Teflon dilators of my design.⁵ With some patients, this procedure is augmented by intrafetal injection of digoxin 1.5 mg or hyperosmolar urea on day 1 or day 2.⁶

In addition to dilation, application of *Laminaria* frequently results in almost complete effacement of the cervix, leading to easy evacuation of the uterus through a widely dilated cervix. A variety of forceps, some also of my design, are used for the evacuation.⁵

Aside from operator skill, the most critical single factor in the safe performance of second-trimester D & E abortion is correct determination of fetal age. This knowledge permits adequate preparation of the patient materials for the procedure. Ultrasonographic examination is essential for consistently accurate diagnosis.^{24,25}

The second most critical factor is adequate preparation of the cervix. This preparation includes dilation and softening over time. In some cases, acute mechanical dilation over a short time permits D & E abortion to be performed, but frequently it is less than optimum, and sometimes it is catastrophic.

A third factor is the availability of appropriate equipment and instruments for the performance of the procedure. Not having these instruments at critical points can result in unnecessary delays in completing the procedure, unnecessary blood loss, and unnecessary trauma to the patient.

In my opinion, the use of general anesthesia unnecessarily adds considerable hazard and risk to the performance of second-trimester D & E abortion.

RUPTURE OF MEMBRANES. When the serial multiple Laminaria technique is used, membranes frequently will be visible through the external os just before the D & E procedure, particularly if the fetal age is more than 15 or 16 menstrual weeks. Even if the membranes are not visible, an important question is whether they should be ruptured before evacuation of the uterus is initiated.

It has been my practice to rupture membranes with a ring forceps or amniohook just before the use of forceps in pregnancies that are beyond 14 menstrual weeks of gestation. Increasingly, I have performed this procedure under direct ultrasound visualization. This action offers several advantages:

1. It allows complete drainage of amniotic fluid for measurement or separation. At the end of the procedure, fluid in the operating basin is almost all blood and can be measured exactly. This measurement is important if the patient loses enough blood to require volume replacement. In all cases, the information is a matter of more than casual interest. It is an important outcome measure in determining the acute or potential morbidity of the operation.
2. Draining the amniotic fluid allows the uterus to contract, thereby helping to close the large venous sinuses and reducing blood loss. The uterine contents are close to the lower uterine segment.
3. Removal of the fluid without a sudden hydrostatic change within the uterine cavity, along with closure of the venous sinuses, reduces the risk of amniotic fluid embolism. The danger of this outcome is heightened if abruptio placentae occurs while the uterus is full of amniotic fluid. Because amniotic fluid embolism is one of the major causes of morbidity and mortality in late abortion, this maneuver is an important means of preventing this potentially catastrophic complication.²⁶

ADJUNCTIVE INFUSION METHODS. A variety of adjunctive infusion methods have been studied that potentially add to the safety of D & E abortion. These methods include amnioinfusion of a hyperosmolar urea solution and intrafetal injection of digoxin or another fetocidal agent.^{4,6} Comparative studies of these methods remain to be published.

MANAGEMENT OF COMPLICATIONS

Complications in abortion can be classified into five major categories: (1) error in the estimate of the length of gestation; (2) failure to empty the uterus; (3) failure to avoid trauma; (4) other iatrogenic complications; and (5) functional problems.

Error in the Estimate of Gestational Length

An orderly review of the major sources of complications and their management must begin with a discussion of preoperative evaluation and accurate estimation of gestational length. One way to establish a positive diagnosis of pregnancy before early abortion is to perform a routine ultrasound examination with an abdominal or vaginal probe. This excellent procedure eliminates the guesswork and permits the exclusion or evaluation of more complicated diagnoses, such as hydatidiform mole and ectopic pregnancy.

A different problem occurs when the initiation of a procedure shows serious underestimation of the length of gestation. This problem may be prevented to some degree by routine ultrasound examination of patients whose pelvic examination shows a uterus that is large for dates or borderline between first and second trimester. The latter distinction is somewhat false because the operator encounters a spectrum of increasing difficulty from the 12th menstrual week on, and each week of gestation brings a different type of complexity. Familiarity with the techniques of early mid-trimester D & E abortion will help the practitioner to manage these situations.

It is embarrassing, not to mention dangerous to the patient, for the practitioner to begin what is presumed to be a routine first-trimester abortion only to be showered with amniotic fluid along with discovery that the "uterus" is actually the "fetal head." It is even worse when the discovery proceeds to the realization that the woman is not in the second trimester but is about to deliver a baby that is near term.

Routine preoperative sonographic evaluation for diagnosis of gestational length, at minimum, has become the standard of care in second-trimester abortion.

Failure to Empty the Uterus

Intraoperative ultrasound has become an important adjunctive tool in second-trimester D & E abortion. Ultrasound does not supplant the proprioception necessary to careful application of surgical instruments, but it can reveal important facts about the location of major tissue to be removed and guide the placement of instruments.

A continued pregnancy, hemorrhage, and infection are the principal signs of failure to empty the uterus, with the latter two being the most common. A continued pregnancy may result from the causes described in the previous section or from an unsuspected uterine anomaly. Treatment consists of repeating the procedure.

The signs and symptoms of retained tissue are cramping, heavy bleeding, and infection signaled by fever. Problems resulting from an incomplete abortion usually will occur within 1 week, if not sooner, but unusually heavy bleeding several weeks after the abortion should be considered evidence of retained tissue until proved otherwise. The most reliable indication of retained tissue is bleeding, particularly when prophylactic antibiotics have been given to the patient. As a rule of thumb, bleeding that is significantly heavier than the normal menstrual flow indicates reaspiration. A history of sudden hemorrhage

that then ceased is valuable. The intervening use of tampons may prevent the examiner from seeing the evidence of this bleeding, but the history alone suggests further study.

A high fever (102°F [39°C] or more) within 72 hours of abortion should be considered evidence of retained tissue with sepsis until proved otherwise. The patient should be treated by prompt reaspiration followed by intravenous administration of antibiotics in combinations designed for anaerobic and microaerophilic bacteria.

After initial blood cultures, cefoxitin 1 to 2 g intravenously every 6 to 8 hours may be used. Other alternatives are combinations of clindamycin, chloramphenicol, or one of the cephalosporins with ampicillin or a penicillinase-resistant penicillin.

Milder infections indicated by a fever of less than 102°F (39°C) and moderate uterine tenderness may be treated with oral antibiotics and reaspiration. An excellent first choice is doxycycline 100 mg twice a day for 10 days.

Patients who experience cramps and moderate bleeding within a few days after abortion but whose symptoms do not seem severe may be advised to massage the uterus firmly while sitting on the toilet at intervals of 1 to 2 hours. Frequently, this treatment results in passage of small clots and relief of symptoms. If this remedy is not effective or if symptoms become worse, the patient should be seen for reaspiration. When in doubt, reaspiration is the treatment of choice.

The controversy concerning the use of prophylactic antibiotics in abortion continues.²⁷⁻²⁹ Many recommend the use of doxycycline 100 mg twice a day for 5 days after abortion, as preemptive antibiotic therapy on the grounds that, by definition, abortion cannot be a sterile operation, and every uterus is contaminated, no matter how careful the operator. Most patients overcome this contamination with natural resistance, but some do not. Because most abortion patients are young and experiencing their first pregnancy, the benefits of protecting their reproductive capability outweigh the disadvantages of routine antibiotic administration.

Failure to Avoid Trauma

There are various approaches to the management of uterine perforation, with treatment depending on the severity of perforation. When perforation of the uterine fundus is recognized before a first-trimester abortion procedure has begun, it may be managed by observation, treatment with oral antibiotics, and delay of the abortion for 2 to 3 weeks. Perforation occurring before second-trimester abortion is far

more serious and normally requires laparotomy and repair.

Recognition of the perforation, however, may occur with the report of generalized abdominal pain by the patient during vacuum aspiration, in the case of the first-trimester abortion, or during instrumental evacuation of the uterus, in the case of second-trimester abortion. This event may be accompanied by the discovery of mesenteric fat in the aspirate or the appearance of small bowel in the forceps or vacuum cannula. Such an event requires immediate laparotomy to repair damage to the bowel or other viscera and to complete the abortion under direct visualization of the uterus.

Perforation laterally into the uterine artery may be impossible to treat, except with hysterectomy or uterine artery ligation. There is no satisfactory way to staunch the bleeding or for the artery to contract. A catastrophic perforation of this type may not be evident for several hours after the abortion, when the patient, having left the recovery room in apparently good condition, goes into shock and dies.

Lacerations of the cervix at the level of the internal os may present the same set of problems seen with overly vigorous manual dilation. Immediate treatment may require digital pressure on the uterine arteries to control bleeding while intravenous oxytocin is administered and the patient is transported to the operating room for laparotomy and repair.

Cervical lacerations of the external os that result from tenaculum tears may be minimized by using *Laminaria*, but when they occur, they usually can be treated by closure with one or two sutures of 2-0 chromic material in a simple or figure-of-eight placement.

Other Iatrogenic Complications

Anesthesia deaths, however uncommon in comparison to other abortion-related deaths, continue to occur and are common enough to cause concern. Although attention has been focused on deaths from local anesthesia, complications and deaths from general anesthesia also have occurred. The common denominator in the deaths from local anesthesia has been toxic or unknown dose levels resulting in convulsions and cardiorespiratory arrest. The importance of staying within the toxic dose levels and avoiding direct intravascular injection cannot be overemphasized.

For example, it rarely is necessary to use more than 20 mL of 1% lidocaine (200 mg) for a paracervical block, or the equivalent. The addition of epinephrine 1:200,000 reduces absorption of this agent and also may reduce the risk of vasovagal reaction.

As already noted, the use of *Laminaria* for dilation further reduces the need for local anesthesia. Only 2 to 4 mL of 1% lidocaine is necessary for the tenaculum site, and a total of 10 to 12 mL is necessary for the entire block (2 mL each at 3:00, 5:00, 7:00, 9:00, and 12:00). A deeper block may be given by injection of an additional 2 mL each at 10:00, 2:00, 5:00, and 7:00.

Management of anesthesia reactions caused by toxic doses consists principally of cardiopulmonary resuscitation and basic system support. Obvious allergic reactions may be managed by the administration of intravenous epinephrine, intramuscular diphenhydramine, and intravenous aminophylline, if necessary.

Functional Complications

To some degree, some complications of abortion seem to be independent of the operator's competence or thoroughness in approach. Some complications may be preventable, but the plan for prevention is not clear. These complications include uterine atony, uterine anomalies, postabortion hematometra, vasovagal reaction, cardiopulmonary arrest not associated with anesthesia toxicity, amniotic fluid embolism with or without subsequent coagulopathy, postabortion amenorrhea, rhesus factor isoimmunization, postabortion depression, ectopic pregnancy, and hydatidiform mole.

Extremely heavy bleeding is not rare in later abortion; however, patients who are only 13 to 14 weeks or more from the last menstrual period, in poor nutrition, multiparous, or recently delivered of a term infant, not to mention patients with fibroids or placenta previa, may experience uterine atony and bleed briskly.

In the event of this type of hemorrhage, even if a perforation is not suspected, the first step in treatment may be to remove the speculum and place digital pressure over the uterine arteries bilaterally. An assistant should start an intravenous line with Ringer's lactate solution and place at least 40 to 50 units of oxytocin in the bottle to run wide open through a minimum 18-gauge needle or the equivalent. Methylergonovine maleate may be given intramuscularly or directly into the cervix.

Once the situation appears to be under control, a ring or other smooth forceps should be placed gently into the uterine cavity to grasp placental tissue that may be remaining. Whether this approach succeeds or fails, it should be followed by insertion of the largest curet that the cervix will accept easily. Use of these two instruments should permit an evaluation of the situation as well as empty the uterus

of remaining tissue. This maneuver will allow the uterus to continue to contract and further control bleeding. If a perforation has occurred, further damage is less likely to develop. As the uterus contracts, assuming that no perforation is present, suction may be applied to continue the process of evacuation.

Bleeding that persists after the uterine cavity appears to be empty may have one of three causes: (1) atony, (2) cervical trauma, or (3) disseminated intravascular clotting (DIC) syndrome. A simple method for making the determination between the first two is to place a suction cannula tip well into the cavity to determine whether persistent bleeding occurs. If it does, the cause probably is atony. If no bleeding occurs until the suction cannula is withdrawn to the level of the internal os or cervical canal, the answer is apparent. The treatment is the same: manual compression and massage of the uterus accompanied by the administration of oxytocin and methylergonovine maleate. The intramuscular administration of 15-methyl prostaglandin (Hemabate) may be used as a last resort for the pharmacologic control of noncoagulopathic hemorrhage.

Continued heavy bleeding from either site (fundal or cervical) may indicate either perforation into the uterine artery, which requires operative intervention, or DIC syndrome.

The management of DIC syndrome first requires recognition. Coagulopathy should be anticipated or suspected whenever a second-trimester abortion patient experiences signs or symptoms of intraoperative amniotic fluid embolism (e.g., coughing, dyspnea, chest pain, cyanosis, convulsions, cardiorespiratory arrest) or when profuse bleeding from the fundus is accompanied by bleeding from needle puncture sites and the whole blood does not clot in a plain glass tube. Baseline studies of the following parameters should be obtained: serum fibrinogen level, fibrin split (degradation) product value, prothrombin and partial thromboplastin times, platelet count, hematocrit value, and hemoglobin level. If the uterus is empty, the bleeding should not persist for longer than 10 to 15 minutes with the combination of oxytocin, manual compression, and administration of methylergonovine maleate and 15-methyl prostaglandin. If bleeding persists, fresh whole blood may be given. The blood can be supplemented or substituted with fresh frozen plasma and packed cells or cryoprecipitate. A rising platelet count, rising fibrinogen value, or declining level of fibrin split products indicates recovery. Results of fibrin split product and some other studies may remain abnormal for 12 to 24 hours.

Postabortion hematometra usually refers to uterine atony or hypotonia occurring shortly after an

otherwise uncomplicated early abortion, although this is sometimes seen in second-trimester patients.³⁰ The patient typically reports uterine pain within an hour after the abortion, although this condition may take several hours to develop. On examination, the uterus is enlarged to 10 to 12 weeks' size, tender, and boggy. Signs of acute abdomen are absent. Reaspiration results in recovery of 50 to 200 mL of blood clots, no tissue, and immediate relief of symptoms. An excellent practice is intramuscular application of methylergonovine maleate as the reaspiration is completed, followed by 3 days of oral medication.

Postabortal hematometra can be prevented in most cases by routine administration of methylergonovine maleate 0.2 mg 3 times a day for 3 days.

Postabortion depression that is severe enough to require psychiatric treatment is rare, particularly if the abortion is conducted in a supportive atmosphere with preoperative counseling. Patients who experience this condition should be referred to a psychiatrist for extended treatment after evaluation by the abortion service personnel. Postabortion psychosis without a history of preabortion psychiatric illness has not been reported.

Hydatidiform moles occur 1 in 1000 or more pregnancies, and the diagnosis usually is apparent preoperatively in the ultrasound examination. It is apparent to the physician during the abortion procedure, particularly if a clear plastic cannula is used for aspiration. The tissue is obvious, even in early pregnancy, but routine histopathologic examination should be obtained.

Management consists primarily of serial β subunit human chorionic gonadotropin titers until results are negative to exclude the existence of malignant trophoblastic material. Pregnancy should be prevented for the subsequent year, preferably through oral contraception because of its high level of effectiveness.

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