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CHAPTER 30: Cesarean Delivery and Peripartum Hysterectomy

The anterior surface of the uterus is opened longitudinally along its midline. This is best accomplished by making an incision a few centimetres long with a scalpel, and then rapidly enlarging it with the scissors to 16 or 18 centimetres. The membranes are then ruptured, the child is seized by one foot and rapidly extracted.

—J. Whitridge Williams (1903)

INTRODUCTION

From the above description, cesarean technique has evolved during the past century. For example, preference for classical hysterotomy has given way to low transverse incision. Evidence-based data now guide many surgical steps and are presented throughout this chapter.

Of definitions, *cesarean delivery* defines the birth of a fetus via laparotomy and then hysterotomy. This definition is not applied to removal of the fetus from the abdominal cavity in the case of uterine rupture or with abdominal pregnancy. Rarely, hysterotomy is performed in a woman who has just died or in whom death is expected soon—*postmortem* or *perimortem cesarean delivery* (Chap. 47, Cardiopulmonary Resuscitation).

In some instances, abdominal hysterectomy is indicated following delivery. When performed at the time of cesarean delivery, the operation is termed *cesarean hysterectomy*. If done within a short time after vaginal delivery, it is termed *postpartum hysterectomy*. *Peripartum hysterectomy* is a broader term that combines these two. In most cases, hysterectomy is total, but supracervical hysterectomy is an option. The adnexa are not usually removed. In most instances, a simple or type I hysterectomy is performed. However, for women with invasive cervical cancer, *radical hysterectomy* removes the uterus, parametrium, and proximal vagina to achieve tumor excision with negative margins. Also, for cases of placenta percreta that extend toward the pelvic sidewall, similar radical excision of the parametrium may be needed.

CESAREAN DELIVERY IN THE UNITED STATES

In the United States, the cesarean delivery rate rose from 4.5 percent in 1970 to 32.9 percent in 2009. Following this peak, the rate has trended slightly downward, and it was 32.0 percent in 2015 (Martin, 2017). Some indications for performing cesarean delivery are shown in Table 30-1. More than 85 percent of these operations are performed for four reasons—prior cesarean delivery, dystocia, fetal jeopardy, or abnormal fetal presentation. The latter three compose the main indications for primary cesarean delivery (Barber, 2011; Boyle, 2013).

TABLE 30-1

Some Indications for Cesarean Delivery

Maternal
Prior cesarean delivery
Abnormal placentation
Maternal request
Prior classical hysterotomy
Unknown uterine scar type

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Uterine incision dehiscence
Prior full-thickness myomectomy
Genital tract obstructive mass
Invasive cervical cancer
Prior trachelectomy
Permanent cerclage
Prior pelvic reconstructive surgery
Prior significant perineal trauma
Pelvic deformity
HSV or HIV infection
Cardiac or pulmonary disease
Cerebral aneurysm or arteriovenous malformation
Pathology requiring concurrent intraabdominal surgery
Perimortem cesarean delivery
Maternal-Fetal
Cephalopelvic disproportion
Failed operative vaginal delivery
Placenta previa or placental abruption
Fetal
Nonreassuring fetal status
Malpresentation
Macrosomia
Congenital anomaly
Abnormal umbilical cord Doppler study
Thrombocytopenia
Prior neonatal birth trauma

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HIV = human immunodeficiency virus; HSV = herpes simplex virus.

The reasons for persistently significant cesarean rates are not completely understood, but some explanations include the following:

1. Women are having fewer children, thus, a greater percentage of births are among *nulliparas,* who are at increased risk for cesarean delivery.
2. The average *maternal age* is rising, and older women, especially nulliparas, have a higher risk of cesarean delivery.
3. The use of *electronic fetal monitoring* is widespread. This practice is associated with an increased cesarean delivery rate compared with intermittent fetal heart rate auscultation. Fetal distress accounts for only a minority of all cesareans. In many more cases, concern for an abnormal or "nonreassuring" fetal heart rate tracing prompts cesarean delivery.
4. Most fetuses presenting *breech* are now delivered by cesarean.
5. The frequency of *operative vaginal delivery* has declined.
6. Rates of *labor induction* continue to rise, and induced labor, especially among nulliparas, raises the cesarean delivery rate.
7. *Obesity,* which is a cesarean delivery risk, has reached epidemic proportions.
8. Rates of cesarean delivery in women with preeclampsia have increased, whereas labor induction rates for these patients have declined.
9. The rate of *vaginal birth after cesarean—VBAC*—has decreased from a high of 28 percent in 1996 and was 11 percent in 2014 (Hamilton, 2015).
10. Elective cesarean deliveries are increasingly being performed for various indications that include *maternal request,* concern for *pelvic floor injury* associated with vaginal birth, and reduction of *fetal injury* rates.
11. *Assisted reproductive technology* is more widely used than in the past and is associated with greater cesarean delivery rates (Reddy, 2007).
12. *Malpractice litigation* related to fetal injury during spontaneous or operative vaginal delivery continues to contribute to the present cesarean delivery rate.

CESAREAN DELIVERY RISKS

To provide accurate informed consent, understanding both maternal and neonatal risks and benefits with surgery is essential. In broad terms, cesarean delivery has higher maternal surgical risks for the current and subsequent pregnancies compared with spontaneous vaginal birth. This is balanced against lower rates of perineal injury and short-term pelvic floor disorders. For the neonate, cesarean delivery offers lower rates of birth trauma and stillbirth but greater rates of initial respiratory difficulties.

Maternal Mortality and Morbidity

For the mother, death attributable solely to cesarean delivery is rare in the United States. Even so, numerous studies attest to increased mortality risks. Clark and colleagues (2008), in a review of nearly 1.5 million pregnancies, found maternal mortality rates of 2.2 per 100,000 cesarean deliveries compared with 0.2 per 100,000 vaginal births. In a metaanalysis of 203 studies, Guise and coworkers (2010) reported a maternal mortality rate of 13 per 100,000 with elective repeat cesarean delivery compared with 4 per 100,000 women undergoing a trial of labor after prior cesarean.

Similar to mortality rates, the frequencies of some maternal complications are increased with all cesarean compared with vaginal deliveries. Villar and associates (2007) reported that maternal morbidity rates increased twofold with cesarean compared with vaginal delivery. Principal among these are infection, hemorrhage, and thromboembolism. In addition, anesthetic complications, which also rarely include death, have a greater incidence with cesarean compared with vaginal delivery (Cheesman, 2009; Hawkins, 2011). Adjacent organs infrequently may be injured, which is described in detail in Urinary Tract or Bowel Injury.

Women who undergo a cesarean delivery are much more likely to be delivered by a repeat operation in subsequent pregnancies. For women undergoing subsequent cesarean, the maternal risks just described are even greater (Cahill, 2006; Marshall, 2011; Silver, 2006).

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As an advantage, cesarean delivery is associated with lower rates of urinary incontinence and pelvic organ prolapse than is vaginal birth (Glazener, 2013; Gyhagen, 2013a,b; Handa, 2011; Leijonhufvud, 2011). Rates of anal incontinence appear uninfluenced by delivery route (Fritel, 2007; Nelson, 2010). Protective advantages persist to some degree over time, but cesarean delivery is not totally protective. Moreover, longitudinal studies suggest that initial pelvic floor advantages gained from cesarean delivery are lost as women age (Dolan, 2010; MacArthur, 2011, 2013; Nelson, 2010). To address this, the National Institutes of Health (2006) held a conference on cesarean delivery on maternal request. It summarized that stress urinary incontinence rates after elective cesarean delivery are lower than those following vaginal delivery. However, the duration of this protection is unclear, particularly in older and multiparous populations. This same panel considered the evidence implicating vaginal delivery in other pelvic floor disorders to be weak and not favoring either delivery route.

Neonatal Morbidity

Cesarean delivery is associated with a lower rate of fetal trauma (Linder, 2013; Moczygemba, 2010). Alexander and colleagues (2006) found that fetal injury complicated 1 percent of cesarean deliveries. Skin laceration was most common, but others included cephalohematoma, clavicular fracture, brachial plexopathy, skull fracture, and facial nerve palsy. Cesarean deliveries following a failed operative vaginal delivery attempt had the highest injury rate, whereas the lowest rate—0.5 percent—occurred in the elective cesarean delivery group. That said, Worley and colleagues (2009) noted that approximately a third of women who were delivered at Parkland Hospital entered spontaneous labor at term, and 96 percent of these delivered vaginally without adverse neonatal outcomes.

Some evidence shows higher asthma and allergy rates in those delivered by cesarean. With the hope to improve neonatal microbiota, swabbing the newborn mouth with a gauze that was incubated in the maternal vagina 1 hour before surgery is described in preliminary studies. However, the American College of Obstetricians and Gynecologists (2017e) does not encourage this practice due to few data and the potential for transmission of harmful organisms.

Cesarean Delivery on Maternal Request

Some women request elective cesarean delivery. Data regarding the true incidence of *cesarean delivery on maternal request (CDMR)* are poor. Rate estimates range from 1 to 8 percent in the United States (Barber, 2011; Declercq, 2005; Gossman, 2006; Menacker, 2006).

Reasons for the request include pelvic floor protection, convenience, fear of childbirth, and reduced risk of fetal injury. Data to address these concerns are slowly accruing. One study of more than 66,000 Chinese parturients compared outcomes of those who elected planned vaginal or primary cesarean delivery (Liu, 2015). Short-term serious maternal morbidity and neonatal mortality rates were similar. For the newborns, rates of birth trauma, infection, and hypoxic ischemic encephalopathy were low in both groups but statistically lower with cesarean delivery. Respiratory distress syndrome rates were greater in the CMDR cohort. A smaller study comparing these two routes of delivery support these findings (Larsson, 2011).

The debate surrounding CDMR includes these medical points, the concept of informed free choice by the woman, and the autonomy of the physician in offering CMDR. During the National Institutes of Health panel (2006) cited above, participants noted that most of the maternal and neonatal outcomes examined had insufficient data to permit recommendations. Despite this, the panel was able to draw a few conclusions, which are echoed by the American College of Obstetricians and Gynecologists (2017a). Namely, CMDR should not be performed before 39 weeks' gestation unless fetal lung maturity is confirmed. Cesarean delivery is ideally avoided in women desiring several children because of placental implantation abnormalities and cesarean hysterectomy risks. Finally, CMDR should not be motivated by the unavailability of effective pain management.

PATIENT PREPARATION

Delivery Availability

No nationally recognized standard of care currently dictates the acceptable time interval to begin cesarean delivery. Previously, a 30-minute decision-to-incision interval was recommended. In studying this, Bloom and coworkers (2001) found that 69 percent of 7450 cesareans performed in labor commenced more than 30 minutes after the decision to operate. In a second study, Bloom and colleagues (2006) evaluated cesarean deliveries performed for emergency indications. They reported that failure to achieve a cesarean delivery decision-to-incision time of less than 30 minutes was not associated with a negative neonatal outcome. A subsequent systematic review echoed this finding (Tolcher, 2014). Despite this, when faced with an acute, catastrophic deterioration in fetal condition, cesarean delivery usually is indicated as rapidly as possible, and thus purposeful delays are

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inappropriate. The American Academy of Pediatrics and the American College of Obstetricians and Gynecologists (2017) recommend that facilities giving obstetrical care should have the ability to initiate cesarean delivery in a time frame that best incorporates maternal and fetal risks and benefits.

Informed Consent

Obtaining informed consent is a process and not merely a medical document (American College of Obstetricians and Gynecologists, 2015). The conversation should enhance a woman's awareness of her diagnosis and contain a discussion of medical and surgical care alternatives, procedure goals and limitations, and surgical risks. For women with a prior cesarean delivery, the option of a trial of labor should be included for suitable candidates. Also, in those desiring permanent sterilization or intrauterine device insertion, consenting for these can be completed concurrently.

An informed patient may decline a particular recommended intervention, and a woman's decision-making autonomy must be respected. In the medical record, clinicians should document her reasons for refusal and should note that the intervention's value and the health consequences of not proceeding with it have been explained.

For Jehovah's Witnesses, informed consent discussions regarding blood products ideally begin early in pregnancy. Acceptable blood products vary widely among individual women, and a preoperative checklist of approved products allows superior preparation (Hubbard, 2015; Husarova, 2016). In general, red cells, white cells, platelets, and plasma are viewed as primary blood components and are eschewed. However, certain clotting factors or cell fractions may be acceptable (Lawson, 2015). Before and after surgery, iron, folate, and, if necessary, erythropoietin are accepted agents to help maximize hemoglobin levels. Perioperatively, phlebotomy should be limited, and pediatric collection tubes are preferable. Intraoperative options include treatment of atony to limit blood loss; topical hemostatic agents, tranexamic acid, and desmopressin to promote clot formation; red blood cell salvage or acute normovolemic hemodilution to provide autologous donation; and controlled hypotensive anesthesia, uterine artery embolization, occlusive vascular balloons, and temporary aortic compression for uncontrolled bleeding (Belfort, 2011; Mason, 2015).

Timing of Scheduled Cesarean Delivery

Adverse neonatal sequelae from neonatal immaturity with elective delivery before 39 completed weeks are appreciable (Clark, 2009; Tita, 2009). To avoid these, assurance of fetal maturity before scheduled elective surgery is essential as outlined by the American Academy of Pediatrics and the American College of Obstetricians and Gynecologists (2017) and discussed in Chapter 31 (Labor and Delivery Considerations). To assist with this and other components of cesarean delivery planning, the American College of Obstetricians and Gynecologists (2011, 2014b) has created Patient Safety Checklists to be completed before the planned surgery.

Preoperative Care

If cesarean delivery is scheduled, a sedative may be given at bedtime the night before surgery. In general, no other sedatives, narcotics, or tranquilizers are administered until after the fetus is born. In one small randomized trial, no benefits were gained from a presurgical enema (Lurie, 2012). Solid food intake is stopped at least 6 to 8 hours before the procedure. Uncomplicated patients may have moderate amounts of clear liquids up to 2 hours before surgery (American Society of Anesthesiologists, 2016). This comports with Enhanced Recovery After Surgery (ERAS) protocols that strive to maintain anabolic homeostasis and advocate clear carbohydrate drinks up to 2 hours before scheduled surgery and early postoperative feeding (Ljungqvist, 2017). Although evidence supports an ERAS approach for many procedures, data specifically addressing this for cesarean delivery are scarce (Wrench, 2015).

The woman scheduled for repeat cesarean delivery typically is admitted the day of surgery and evaluated by the obstetrical and anesthesia teams. Recently performed hematocrit and indirect Coombs test are reviewed. If the latter is positive, then availability of compatible blood must be ensured.

As discussed in Chapter 25 (Neuraxial Analgesia), regional analgesia is preferred for cesarean delivery. An antacid is given shortly before regional analgesia or induction of general anesthesia. One example is Bicitra, 30 mL orally in a single dose. This minimizes the lung injury risk from gastric acid aspiration. Once the woman is supine, a wedge beneath the right hip and lower back creates a left lateral tilt to aid venous return and avoid hypotension. Data are insufficient to determine the value of fetal monitoring before scheduled cesarean delivery in women without risk factors. Our practice is to obtain a 5-minute tracing prior to elective cases. At minimum, fetal heart sounds should be documented in the operating room prior to surgery.

Of further preparations, hair removal at the surgical site does not lower surgical site infection (SSI) rates (Kowalski, 2016). However, if hair is obscuring,

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it is removed the day of surgery by clipping, which is associated with fewer SSIs than shaving (Tanner, 2011). Chemical depilation the night before surgery compared with clipping has similar SSI rates (Lefebvre, 2015). An electrosurgical grounding pad is placed near the surgical incision and typically on the lateral thigh. An indwelling bladder catheter is typically placed at Parkland Hospital to collapse the bladder away from the hysterotomy incision, to avert urinary retention secondary to regional analgesia, and to allow accurate postoperative urine measurement. Small studies show that catheterization may be withheld in hemodynamically stable women to minimize urinary infections (Abdel-Aleem, 2014; Li, 2011; Nasr, 2009).

The risk of venous thromboembolism is increased with pregnancy and almost doubled in those undergoing cesarean delivery (James, 2006). Accordingly, for all women not already receiving thromboprophylaxis, the American College of Obstetricians and Gynecologists (2017d) recommends initiation of pneumatic compression hose before cesarean delivery. These are usually discontinued once the woman ambulates. Recommendations between organizations vary, and the American College of Chest Physicians suggests only early ambulation for women without risk factors who are undergoing cesarean delivery (Bates, 2012). For women already receiving prophylaxis or those with increased risk factors, they support escalation of prophylaxis. Last, the Royal College of Obstetricians and Gynaecologists (2015) are the most conservative and suggest pharmacological prophylaxis for the largest proportion of patients. These various methods and recommendations are discussed in Chapter 52 and are shown in Table 52-6.

Some women scheduled for cesarean delivery have concurrent comorbidity that requires specific management in anticipation of surgery. Among others, these include insulin-requiring or gestational diabetes, coagulopathy or thrombophilia, chronic corticosteroid use, and significant reactive airway disease. Surgical preparations are discussed in the respective chapters covering these topics.

Infection Prevention

Antibiotic Prophylaxis

Cesarean delivery is considered a clean contaminated case, and postoperative febrile morbidity is common. Numerous good-quality trials show that a single dose of an antibiotic given at the time of cesarean delivery significantly decreases infectious morbidity (Smaill, 2014). Although more obvious for women undergoing unscheduled cesarean delivery, this practice also pertains to women undergoing elective surgery (American College of Obstetricians and Gynecologists, 2016). Depending on drug allergies, most recommend a single intravenous dose of a β-lactam antibiotic—either a cephalosporin or extended-spectrum penicillin. A 1-g dose of cefazolin (Ancef) is an efficacious and cost-effective choice. Additional doses are considered in cases with blood loss >1500 mL or with duration longer than 3 hours. Recommendations for the best dose in obese parturients are conflicting (Ahmadzia, 2015; Maggio, 2015; Swank, 2015; Young, 2015). One recent pharmacokinetic analysis showed sufficient tissue levels with a 2-g dose for cesarean deliveries lasting 1.5 hours. Authors recommended consideration for redosing in obese women if surgeries were longer (Grupper, 2017).

A growing body of evidence supports extending the antibiotic spectrum (Andrews, 2003; Tita, 2008). One large randomized trial added azithromycin, 500 mg intravenously, to standard prophylaxis prior to cesarean delivery for women in labor or with ruptured membranes (Tita, 2016). Rates of wound infection and endometritis were significantly lower in the extended-spectrum group compared with those in the standard prophylaxis cohort.

In pregnant women with a history of infection with methicillin-resistant *Staphylococcus aureus* (MRSA), a single dose of vancomycin added to the standard prophylaxis for cesarean deliveries can be elected. Decolonization plays a limited role but may be considered prior to a planned cesarean delivery in women with known MRSA colonization (American College of Obstetricians and Gynecologists, 2016).

Significant penicillin or cephalosporin allergy, which manifests by anaphylaxis, angioedema, respiratory distress, or urticaria, merits prophylaxis with a single 600-mg intravenous dose of clindamycin combined with a weight-based dose of an aminoglycoside as an alternative. A 900-mg clindamycin dose is used for obese patients.

Antibiotic administration before surgical incision lowers postoperative infection rates without adverse neonatal effects compared with drug administration after umbilical cord clamping (Mackeen, 2014b; Sullivan, 2007; Witt, 2011). Prophylaxis is ideally administered within the 60 minutes prior to the start of planned cesarean delivery. For emergent delivery, antibiotics are given as soon as feasible.

Preoperative preparation of the abdominal wall skin is effective to prevent wound infection. Either chlorhexidine or povidone-iodine solutions are suitable (Hadiati, 2014; Ngai, 2015; Springel, 2017). In studies that found a difference, chlorhexidine was favored, and this is our practice (Menderes, 2012; Tuuli, 2016a). In addition, preoperative vaginal cleansing with a povidone-iodine scrub has been evaluated in small randomized trials (Haas, 2014; Caissutti, 2017). Some showed lower rates of metritis, especially for those with ruptured membranes or active labor, but not lower rates of

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wound infection (Haas, 2010; Memon, 2011; Yildirim, 2012). Some recommend preoperative vaginal cleansing, but we do not do this at Parkland Hospital.

Antibiotic prophylaxis against infective endocarditis is not recommended for most cardiac conditions—exceptions are women with cyanotic heart disease, prosthetic valves, or both (American College of Obstetricians and Gynecologists, 2016). Regimens selected for routine cesarean infection prophylaxis will also serve as appropriate endocarditis coverage (Chap. 49, Infective Endocarditis).

Other Preventions

Glycemic control in diabetics lowers wound infection rates and is emphasized in Chapter 57 (First Trimester). Smoking is another modifiable risk, and its mitigation is especially helpful for morbidly obese women (Alanis, 2010; Avila, 2012; Shree, 2016). Intraoperative normothermia lowers wound infection rates in general surgery and is a Surgical Care Improvement Project measure (Kurz, 1996; The Joint Commission, 2016). This tenet might logically be extrapolated to cesarean delivery, although definitive studies are lacking (Carpenter, 2012). Perioperative supplementation with high-concentration inspired oxygen does not lower wound infection rates (Duggal, 2013; Klingel, 2013).

Surgical Safety

The Joint Commission (2013) established a protocol to prevent surgical errors. For cesarean delivery, all relevant documents are verified immediately before surgery, and a “time out” is completed. The “time out” requires attention of the entire team to confirm that the patient, site, and procedure are correct. Important discussions also include introduction of the patient-care team members, verification of prophylactic antibiotics, estimation of procedure length, and communication of anticipated complications. Additionally, requests for special instrumentation should be addressed preoperatively to prevent potential patient compromise and intraoperative delays.

An instrument, sponge, and needle count before and after surgery is crucial to surgical safety. If counts are not reconciled, radiographic imaging for retained foreign objects is obtained (American College of Obstetricians and Gynecologists, 2014a).

CESAREAN DELIVERY TECHNIQUE

With minor variations, surgical performance of cesarean delivery is comparable worldwide. Most steps are founded on evidence-based data, and these have been reviewed by Dahlke and associates (2013). As with all surgery, a clear understanding of relevant anatomy is essential, and this is described and illustrated in Chapter 2 (Anterior Abdominal Wall).

Laparotomy

In obstetrics, a suprapubic transverse incision or a midline vertical one is chosen for laparotomy. Transverse abdominal entry is by either Pfannenstiel or Maylard incisions. Of all these, the Pfannenstiel incision is selected most frequently for cesarean delivery.

Transverse incisions follow Langer lines of skin tension. Thus, compared with vertical ones, Pfannenstiel incisions offer superior cosmesis and lower incisional hernia rates. Use of the Pfannenstiel incision, however, is often discouraged for cases in which a large operating space is essential or in which access to the upper abdomen may be needed. With transverse incisions, because of the layers created during incision of the internal and external oblique aponeuroses, purulent fluid can collect between these. Therefore, some favor a midline vertical incision for cases with high infection risks. Emergent entry is typically faster with vertical incision during primary and repeat cesarean delivery (Wylie, 2010). Last, neurovascular structures, which include the ilioinguinal and iliohypogastric nerves and superficial and inferior epigastric vessels, are often encountered with transverse incisions. Logically, bleeding, wound hematoma, and neurological disruption may more frequently complicate these incisions compared with vertical ones. The best incision for the morbidly obese parturient is unclear (Smid, 2016). As discussed in Chapter 48 (Bariatric Surgery), our preference with very obese women is a periumbilical midline vertical incision.

The Maylard incision differs mainly from the Pfannenstiel in that the bellies of the rectus abdominis muscle are transected horizontally to widen the operating space. It is technically more difficult due to its required muscle cutting and isolation and ligation of the inferior epigastric arteries, which lie laterally to these muscle bellies.

Once access is gained, metal handheld retractors provide exposure for hysterotomy. A few small randomized studies have evaluated postcesarean

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wound infection rates with a disposable plastic barrier retractor (Alexis-O). Results showing benefit are contradictory (Hinkson, 2016; Scolari Childress, 2016; Theodoridis, 2011).

Transverse Incisions

With the Pfannenstiel incision, the skin and subcutaneous tissue are incised using a low, transverse, slightly curvilinear incision. This is made at the level of the pubic hairline, which is typically 3 cm above the superior border of the symphysis pubis. The incision is extended laterally sufficiently to accommodate delivery—12 to 15 cm is typical.

Sharp dissection is continued through the subcutaneous layer to the fascia. The superficial epigastric vessels can usually be identified halfway between the skin and fascia, several centimeters from the midline, and are coagulated. If lacerated, these may be suture ligated with 3–0 plain gut suture or coagulated with an electrosurgical blade.

The fascia is then incised sharply at the midline. The anterior abdominal fascia is typically composed of two visible layers, the aponeurosis from the external oblique muscle and a fused layer containing aponeuroses of the internal oblique and transverse abdominis muscles. Ideally, the two layers are individually incised during lateral extension of the fascial incision. The inferior epigastric vessels usually lie outside the lateral border of the rectus abdominis muscle and beneath the fused aponeuroses of the internal oblique and transverse abdominis muscles. Thus, although infrequently required, extension of the fascial incision further laterally may cut these vessels. With extension, these vessels are best identified and coagulated or ligated to prevent bleeding and vessel retraction.

Once the fascia is incised, the inferior fascial edge is grasped with Kocher clamps and elevated by an assistant as the operator separates the fascial sheath from the underlying rectus abdominis muscle either bluntly or sharply until the superior border of the symphysis pubis is reached. Next, the superior fascial edge is grasped and again, separation of fascia from the rectus muscle is completed. Blood vessels coursing between the sheath and muscles are clamped, cut, and ligated, or they are coagulated with an electrosurgery blade. Meticulous hemostasis is imperative to lower rates of incisional hematoma and infection. The fascial separation progresses cephalad and laterally to create a semicircular area above the transverse incision with a radius of approximately 8 cm. This will vary depending on fetal size. The rectus abdominis and pyramidalis muscles are then separated in the midline, first superiorly and then inferiorly, by sharp and blunt dissection to expose the transversalis fascia and peritoneum.

The transversalis fascia and preperitoneal fat are bluntly dissected away to reach the underlying peritoneum. The peritoneum near the upper end of the incision is opened carefully, either bluntly or by elevating it with two hemostats placed approximately 2 cm apart. This upper site lowers cystotomy risks. The tented fold of peritoneum between the clamps is examined and palpated to ensure that omentum, bowel, or bladder is not adjacent. The peritoneum is then incised. The peritoneal incision is extended superiorly to the upper pole of the fascial dissection and downward to just above the peritoneal reflection over the bladder. Importantly, in women with prior intraabdominal surgery, including cesarean delivery, omentum or bowel may be adhered to the undersurface of the peritoneum. In women with obstructed labor, the bladder may be pushed cephalad almost to the level of the umbilicus.

Midline Vertical Incision

This incision begins 2 to 3 cm above the superior margin of the symphysis. It should sufficiently long to allow fetal delivery, and 12 to 15 cm is typical. Sharp or electrosurgical blade dissection through the subcutaneous layers ultimately exposes the anterior rectus sheath. A small opening is made sharply with scalpel in the upper half of the linea alba. Placement here helps avoid potential cystotomy. Index and middle fingers are placed beneath the fascia to elevate it, and the fascial incision is extended first superiorly and then inferiorly with scissors. Midline separation of the rectus muscles and pyramidalis muscles and peritoneal entry are similar to those with the Pfannenstiel incision.

Hysterotomy

Most often, the lower uterine segment is incised transversely as described by Kerr in 1921. Occasionally, vertical incision confined solely to the lower uterine segment may be elected (Krönig, 1912). In contrast, a classical incision begins as a low-vertical incision, which is then extended cephalad into the active portion of the uterine corpus. Last, a fundal or even posterior incision may be selected for cases with placental accrete syndromes.

Low Transverse Cesarean Incision

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For most cesarean deliveries, this incision is preferred. Compared with a classical incision, it is easier to repair, causes less incision-site bleeding, and promotes less bowel or omentum adherence to the myometrial incision. Located in the inactive segment, it also is less likely to rupture during a subsequent pregnancy.

Before any hysterotomy, the surgeon palpates the fundus to identify degrees of uterine rotation. The uterus may be rotated so that one round ligament is more anterior and closer to the midline. In such cases, the uterus can be manually reoriented and held to permit centering of the incision. This avoids incision extension into and laceration of the adjacent uterine artery. A moist sponge may be used to pack protruding bowel away from the operative field.

The reflection of peritoneum at the upper margin of the bladder and overlying the lower uterine segment is grasped in the midline with forceps and incised transversely with scissors (Fig. 30-1). Following this initial incision, scissors are inserted between peritoneum and lower uterine segment. Open scissors are pushed laterally from the midline on each side. This transverse peritoneal incision extends almost the full length of the lower uterine segment. As the lateral margin on each side is approached, the scissors are directed slightly cephalad (Fig. 30-2). The lower edge of peritoneum is elevated, and the bladder is gently separated from the underlying lower uterine segment with blunt or sharp dissection within this vesicouterine space (Fig. 30-3). This bladder flap creation effectively moves the bladder away from the planned hysterotomy site. It also helps prevent bladder laceration if an unintended inferior hysterotomy extension occurs during fetal delivery.

FIGURE 30-1

The loose peritoneum above the bladder reflection is grasped with forceps and incised with Metzenbaum scissors.

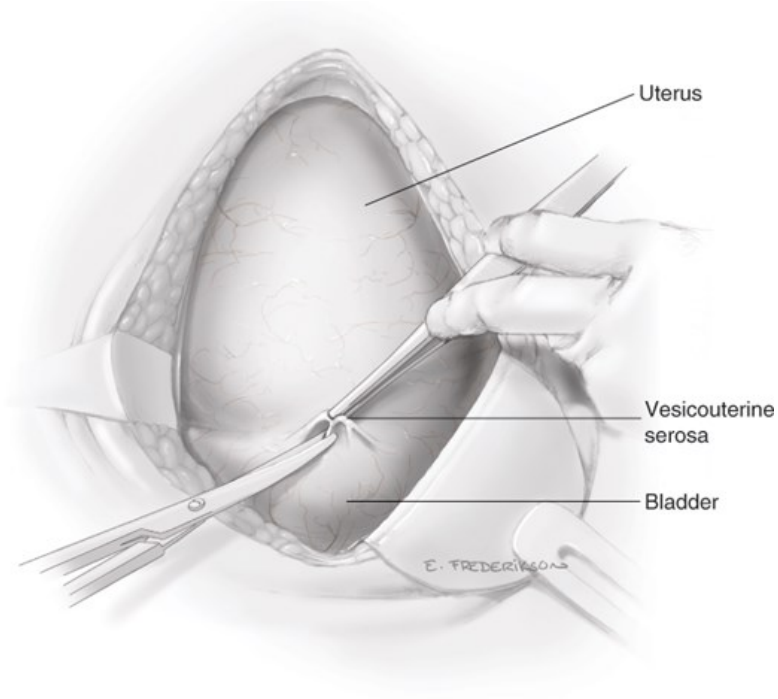

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FIGURE 30-2

This peritoneal edge is elevated and incised laterally.

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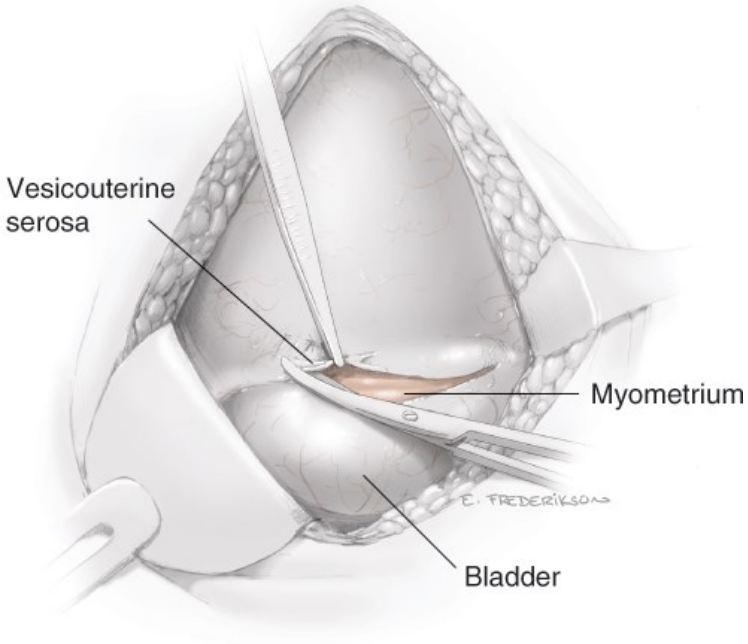

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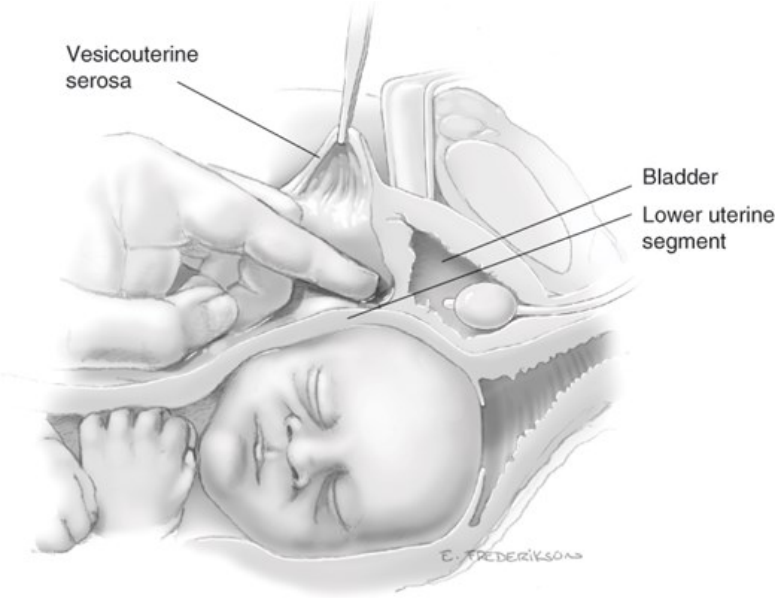
FIGURE 30-3

Cross section shows blunt dissection of the bladder off the uterus to expose the lower uterine segment.



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In general, this caudad separation of bladder does not exceed 5 cm and usually is less. However, in instances in which cesarean hysterectomy is planned or anticipated, extended caudad dissection is recommended to aid total hysterectomy and decrease the risk of cystotomy.

Some surgeons do not create a bladder flap. The main advantage is a shorter skin incision-to-delivery time. However, data supporting this practice are limited (O'Neill, 2014; Tuuli, 2012).

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Uterine Incision

The uterus is entered through the lower uterine segment. Digital palpation to find the physiological border between firmer upper segment myometrium and the more flexible lower segment can guide placement. The bladder flap incision can also serve as a guide, and a hysterotomy site near this line is often selected.

For women with advanced or complete cervical dilatation, the hysterotomy is placed relatively higher. Failure to adjust increases the risk of lateral extension of the incision into the uterine arteries. It may also lead to incision of the cervix or vagina rather than the lower uterine segment. Such incisions into the cervix can distort postoperative cervical anatomy.

The uterus can be incised by various techniques. Each is initiated by using a scalpel to transversely incise the exposed lower uterine segment for 1 to 2 cm in the midline (Fig. 30-4). Repetitive shallow strokes avoid fetal laceration. As the myometrium thins, a fingertip can then bluntly enter the uterine cavity. Once the uterus is opened, the hysterotomy is lengthened by simply spreading the incision, using lateral and slightly upward pressure applied with each index finger (Fig. 30-5). Some evidence also supports widening the lower-uterine-segment incision instead with fingers pulling in opposition in a cephalocaudad direction (Cromi, 2008; Xodo, 2016).

FIGURE 30-4

The myometrium is incised with shallow strokes to avoid cutting the fetal head.

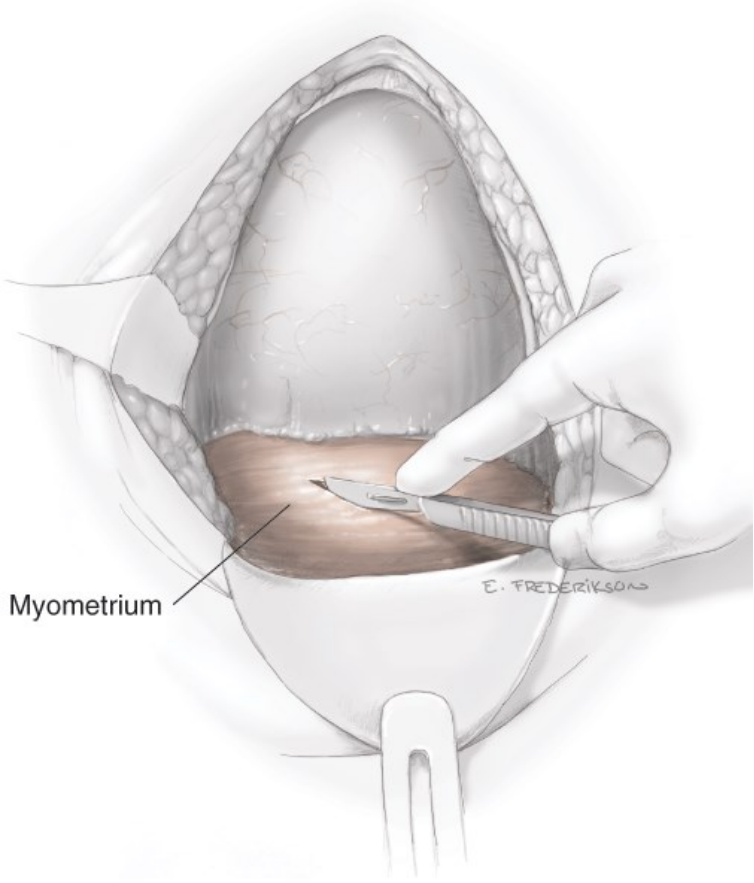

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FIGURE 30-5

After entering the uterine cavity, the incision is extended laterally with fingers or with bandage scissors (*inset*).

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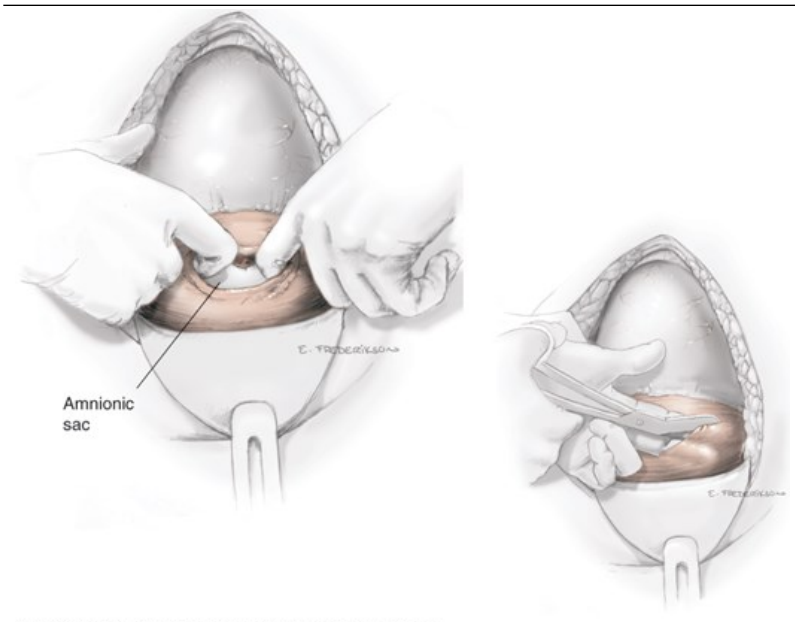

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Alternatively, if the lower uterine segment is thick and unyielding, cutting laterally and then slightly upward with bandage scissors will lengthen the incision. Importantly, when scissors are used, the index and midline fingers of the nondominant hand should be insinuated beneath the myometrium and above fetal parts to prevent fetal laceration. Comparing blunt and sharp expansion of the initial uterine incision, blunt stretch is associated with fewer unintended incision extensions, shorter operative time, and less blood loss. However, the rates of infection and need for transfusion do not differ (Asıcıoglu, 2014; Saad, 2014).

The uterine incision is made large enough to allow delivery of the fetus without tearing into the uterine vessels that course along the lateral uterine margins. If the placenta is encountered in the incision line, it must be either detached or incised. Placental function is thereby compromised, and thus delivery is performed expeditiously.

At times, a low transverse hysterotomy is selected but provides inadequate room for delivery. In such instances, one corner of the hysterotomy incision is extended cephalad into the contractile portion of the myometrium—a *J incision*. If this is completed bilaterally, a *U incision* is formed. Last, some prefer instead to extend in the midline—a *T incision*. As expected, each has higher intraoperative blood loss (Boyle, 1996; Patterson, 2002). Moreover, as these extend into the contractile portion, a trial of labor is more likely to be complicated by uterine rupture in future pregnancies.

Delivery of the Fetus

In a cephalic presentation, a hand is slipped into the uterine cavity between the symphysis and fetal head. The head is elevated gently with the fingers and palm through the incision. Once the head enters the incision, delivery may be aided by modest transabdominal fundal pressure (Fig. 30-6).

FIGURE 30-6

Delivery of the fetal head.

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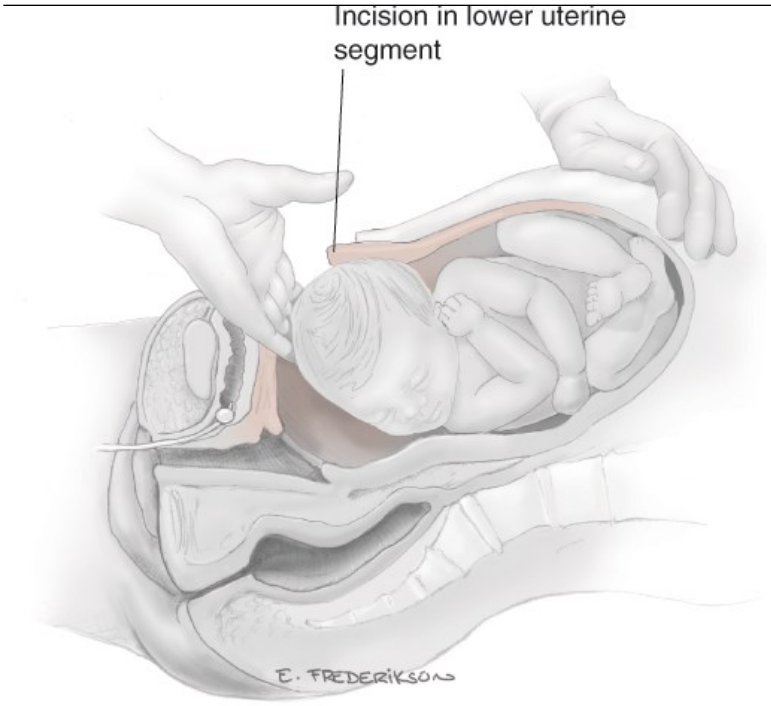

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After a long labor with cephalopelvic disproportion, the fetal head may be tightly wedged in the birth canal. Release of an impacted fetal head raises the risk of hysterotomy extension, of associated blood loss, and of fetal skull fracture. In this situation, there are three considerations for delivery. First, a "push" method may be used. With this, upward pressure exerted by a hand in the vagina by an assistant will help to dislodge the head and allow its delivery above the symphysis. If this is anticipated, a patient in frog-leg position may allow easier vaginal access.

Second, as an alternative, a "pull" method grasps the fetal legs to bring them through the hysterotomy. The fetus is then delivered by traction as one would complete a breech extraction. Support for this latter approach comes only from small randomized trials and retrospective cohort studies (Berhan, 2014; Jeve, 2016; Nooh, 2017). A low vertical hysterotomy incision, which will give more room for the "pull" technique, may be selected. If a low transverse incision has already been made, then this can be extended to a J-, U-, or T-incision as previously discussed.

The third method is use of the "fetal pillow," which is a distensible intravaginal balloon that when inflated, elevates the fetal head. The device is available outside the United States, but evidence for its efficacy is limited (Safa, 2016; Seal, 2016).

Conversely, in women without labor, the fetal head may be unmolded and without a leading cephalic point. The round head may be difficult to lift through the uterine incision in a relatively thick lower segment that is unattenuated by labor. In such instances, either forceps or a vacuum device may be used to deliver the fetal head (Fig. 30-7).

FIGURE 30-7

A. The first cesarean forceps blade is placed. **B.** Slight upward and outward traction is used to lift the head through the incision.

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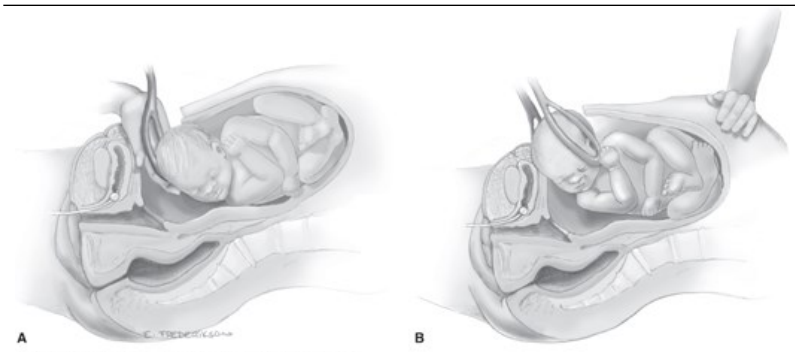

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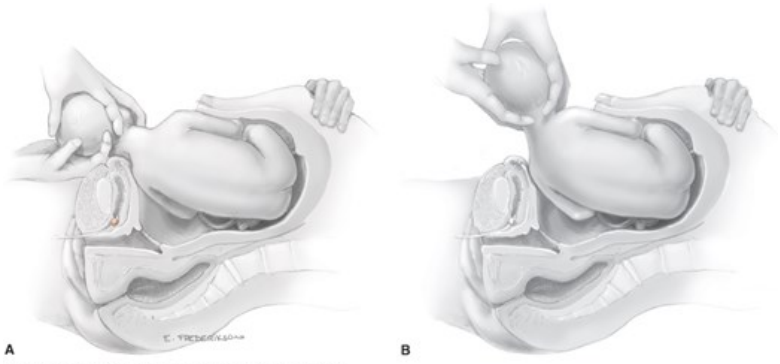
After head delivery, a finger should be passed across the fetal neck to determine whether it is encircled by one or more umbilical cord loops. If present, these are slipped over the head. The head is rotated to an occiput transverse position, which aligns the fetal bisacromial diameter vertically. The sides of the head are grasped with two hands, and gentle downward traction is applied until the anterior shoulder enters the hysterotomy incision (Fig. 30-8). Next, by upward movement, the posterior shoulder is delivered. During delivery, abrupt or powerful force is avoided to avert brachial plexus injury. With steady outward traction, the rest of the body then readily follows. Gentle fundal pressure may aid this.

FIGURE 30-8

The anterior **(A)** and then the posterior **(B)** shoulder are delivered.



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With some exceptions, current American Heart Association neonatal resuscitation recommendations eschew suctioning immediately following birth, even with meconium present (Wyckoff, 2015). A fuller discussion of this and delayed umbilical cord clamping is found in Chapter 27 (Delivery of the Shoulders). The umbilical cord is clamped, and the newborn is given to the team member who will conduct resuscitative efforts as needed.

Comparing elective cesarean under neuraxial anesthesia and spontaneous vaginal deliveries, studies show that the need for neonatal resuscitation is not practically significant between the two (Atherton, 2006; Gordon, 2005; Jacob, 1997). The American Academy of Pediatrics and the American College of Obstetricians and Gynecologists (2017) recommend that “a qualified person who is skilled in neonatal resuscitation should be in the delivery room.” At Parkland Hospital, pediatric nurse practitioners attend uncomplicated, scheduled cesarean deliveries. Notably, as anticipated neonatal risks rise, so too should the resuscitative skills of the attendants (Wyckoff, 2015).

To promote breastfeeding, the American College of Obstetricians and Gynecologists (2017b) recommends skin-to-skin contact between newborn and mother in the delivery room. Although most randomized trials focus on vaginal birth, several small studies support such contact following cesarean delivery, and this our practice (Moore, 2016; Stevens, 2014).

After birth, an intravenous infusion containing two ampules or 20 units of oxytocin per liter of crystalloid is infused at 10 mL/min. Some prefer higher infusion dosages, however, nondilute boluses are avoided because of associated hypotension (Roach, 2013). Once the uterus contracts satisfactorily, the rate can be reduced. An alternative is *carbetocin*—a longer-acting oxytocin derivative that is not available in the United States—that provides suitable, albeit more expensive, hemorrhage prophylaxis (Jin, 2016). Ergot-alkaloids are second-tier agents and carry hypertensive side effects. Carboprost, a 15-methyl derivative of prostaglandin $F_{2\alpha}$, is another second-tier agent used to treat uterine atony. Some but certainly not all studies

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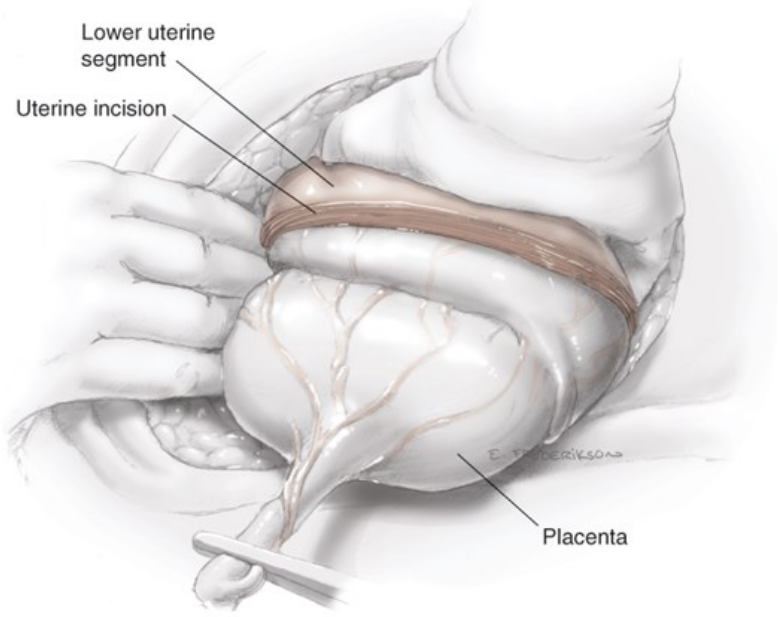
indicate that misoprostol appears to perform similarly to oxytocin (Chaudhuri, 2014; Conde-Agudelo, 2013). Finally, some recommend the use of tranexamic acid added to a standard oxytocin infusion to decrease blood loss (Simonazzi, 2016; Wang, 2015). Its antifibrinolytic action and effects on thromboembolism rates in pregnant surgical patients are unclear. Larger trials are needed before widespread use. Additional discussions of all these agents are found in Chapter 41 (Risk Factors).

Delivery of the Placenta

The uterine incision is observed for any vigorously bleeding sites. These should be quickly clamped with Pennington or ring forceps. Although some surgeons may prefer manual removal of the placenta, spontaneous delivery prompted by some cord traction may reduce the risk of operative blood loss and infection (Anorlu, 2008; Baksu, 2005). Fundal massage may begin as soon as the fetus is delivered to hasten placental separation and delivery (Fig. 30-9).

FIGURE 30-9

Placenta bulging through the uterine incision as the uterus contracts. A hand gently massages the fundus to help aid spontaneous placental separation.



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Immediately after delivery and quick gross inspection of the placenta, the uterine cavity is suctioned and wiped out with a gauze sponge to remove avulsed membranes, vernix, and clots. In the past, double-gloved fingers or ring forceps placed through the hysterotomy incision were used to dilate an ostensibly closed cervix. This practice does not reduce infection rates from potential hematometra and is not recommended (Kirscht, 2017; Liabsuetrakul, 2011).

Uterine Repair

After placental delivery, the uterus is lifted through the incision and onto the draped abdominal wall, and the fundus is covered with a moistened laparotomy sponge. We favor this and believe a relaxed, atonic uterus can be recognized quickly and massage applied. Incision and bleeding points are more easily visualized and repaired, especially if there have been extensions. Adnexal exposure is superior, and thus, tubal sterilization is easier. Instead, some clinicians prefer to close the hysterotomy with the uterus in situ. Comparing these two approaches, febrile morbidity, pain, and blood loss are not significantly different (Walsh, 2009; Zaphiratos, 2015).

Before hysterotomy closure, previously clamped large vessels may be ligated separately or incorporated within the running incision closure. IUD insertion, if planned, is completed prior to hysterotomy closure (Chap. 38, Progestin Implants). One angle of the uterine incision is grasped to stabilize

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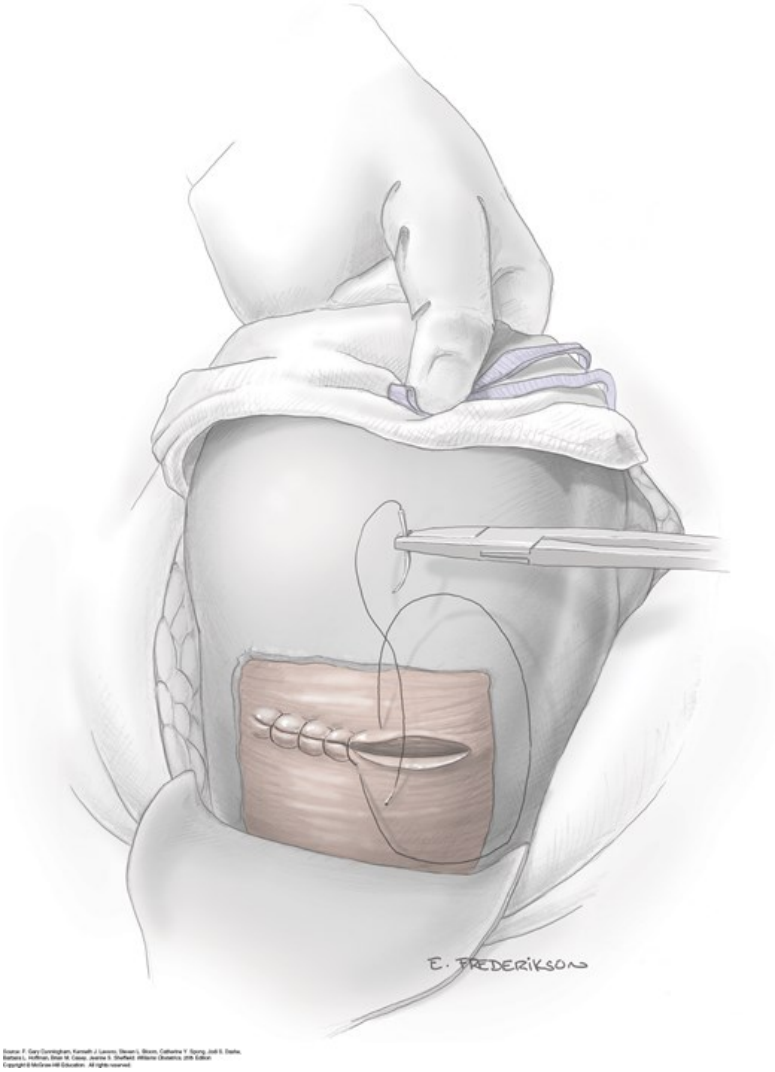
and maneuver the incision. The uterine incision is then closed with one or two layers of continuous 0- or no. 1 absorbable suture (Fig. 30-10). Chromic catgut suture is used by many, but some prefer synthetic delayed-absorbable polyglactin 910 (Vicryl). In subsequent pregnancy, neither suture type has been shown superior by mitigating against greater rates of adverse pregnancy outcomes such as uterine incision rupture (CORONIS Collaborative Group, 2016). Single-layer closure is typically faster and is not associated with higher rates of infection or transfusion (CAESAR Study Collaborative Group, 2010; Dodd, 2014; Roberge, 2014). Moreover, most studies observed that the number of layers does not significantly affect complication rates in the next pregnancy (Chapman, 1997; CORONIS Collaborative Group, 2016; Durnwald, 2003; Roberge, 2011).

FIGURE 30-10

The cut edges of the uterine incision are approximated with a running, locking suture.



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At Parkland Hospital, we use a one-layer uterine closure with chromic catgut. The initial suture is placed just beyond one angle of the uterine incision. A continuous, locking suture line for hemostasis is then performed, with each suture penetrating the full thickness of the myometrium. The suture line then extends to a point just beyond the opposite incision angle. If approximation is not satisfactory after a single layer or if bleeding sites persist, then more sutures are required. Either another layer of running suture is placed to achieve approximation and hemostasis, or individual bleeding sites can be secured with targeted figure-of-eight or mattress stitches.

Traditionally, the peritoneum in the anterior cul-de-sac is approximated with a continuous 2–0 chromic catgut suture line. Multiple randomized trials suggest that omission of this step causes no postoperative complications (Grundsell, 1998; Irion, 1996; Nagele, 1996). If tubal sterilization is to be performed, it is completed as described in Chapter 39 (Puerperal Tubal Sterilization).

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Adhesions

Following cesarean delivery, adhesions commonly form within the vesicouterine space or between the anterior abdominal wall and uterus. And, with each successive pregnancy, the percentage of affected women and adhesion severity rise (Morales, 2007; Tulandi, 2009). Adhesions can significantly lengthen incision-to-delivery time and total operative time (Rossouw, 2013; Sikirica, 2012). Although occurring infrequently, rates of cystotomy and bowel injury are also increased because of adhesive disease (Rahman, 2009; Silver, 2006).

Intuitively, scarring can be reduced by handling tissues delicately, achieving hemostasis, and minimizing tissue ischemia, infection, and foreign-body reaction. Most recent data on short- and long-term outcomes show no benefit to peritoneal closure (CAESAR Study Collaborative Group, 2010; CORONIS Collaborative Group, 2013, 2016; Kapustian, 2012). Similarly, most studies show no benefit from placement of an adhesion barrier at the hysterotomy site (Edwards, 2014; Kiefer, 2016).

Abdominal Closure

Any laparotomy sponges are removed, and the paracolic gutters and cul-de-sac are gently suctioned of blood and amnionic fluid. Some surgeons irrigate the gutters and cul-de-sac, especially in the presence of infection or meconium. Routine irrigation in low-risk women, however, leads to greater intraoperative nausea but not to lower postoperative infection rates (Eke, 2016; Viney, 2012).

Prior to abdominal closure, correct sponge and instrument counts are verified. The rectus abdominis muscle bellies are allowed to fall into place. With significant diastasis, the rectus muscles may be approximated with one or two figure-of-eight sutures of 0 or no. 1 chromic gut suture. The overlying rectus fascia is closed by a continuous, nonlocking technique with a delayed-absorbable suture. In patients with a higher risk for infection, there may be theoretical value in selecting a monofilament suture here rather than braided material.

The subcutaneous tissue usually need not be closed if it is less than 2 cm thick. With thicker layers, however, closure is recommended to minimize seroma and hematoma formation, which can lead to wound infection and/or disruption (Bohman, 1992; Chelmow, 2004). One recent metaanalysis found lower rates of seroma formation and of developing any wound complication with closure, but hematoma and wound infection rates were unaffected (Pergialiotis, 2017). Addition of a subcutaneous drain does not prevent significant wound complications (Hellums, 2007; Ramsey, 2005).

Skin is closed with a running subcuticular stitch of 4–0 delayed-absorbable suture, with adhesive glue, or with staples. In comparison, final cosmetic results and infection rates appear similar, skin suturing takes longer, but wound separation rates are higher with metal staples (Basha, 2010; Figueroa, 2013; Mackeen, 2014a, 2015). Poliglecaprone 25 (Monocryl) or polyglactin 910 (Vicryl) are both suitable (Tuuli, 2016b). Outcomes with 2-octyl cyanoacrylate adhesive (Dermabond) were equivalent to sutures for Pfannenstiel incisions (Daykan, 2017; Siddiqui, 2013). A sterile thin abdominal wound dressing is sufficient. In morbidly obese women, application of a prophylactic negative-pressure device atop the closed skin incision to prevent seroma and subsequent infection does not appear to lower wound complication rates (Hussamy, 2018; Smid, 2017).

Joel-Cohen and Misgav Ladach Techniques

The Pfannenstiel-Kerr technique just described has been used for decades. More recently, Joel-Cohen and Misgav Ladach techniques have been added (Holmgren, 1999). These differ from traditional Pfannenstiel-Kerr entry mainly by their initial incision placement and greater use of blunt dissection.

The Joel-Cohen technique creates a straight 10-cm transverse skin incision 3 cm below the level of the anterior superior iliac spines (Oloffson, 2015). The subcutaneous tissue layer is opened sharply 2 to 3 cm in the midline. This is carried down, without lateral extension, to the fascia. A small transverse incision is made in the fascia, and curved Mayo scissors are pushed laterally on each side and beneath intact subcutaneous fat to incise the fascia. With this incision completed, an index finger from each hand is inserted between the rectus abdominis muscle bellies and beneath the fascia. One finger is moved cranially and the other caudally, in opposition, to separate the bellies and further open the fascial incision. Then, a finger from each hand hooks under each belly to stretch the muscles laterally. The peritoneum is entered sharply, and this incision is sharply extended cephalocaudad. Entry with the Misgav Ladach technique differs in that the peritoneum is entered bluntly (Holmgren, 1999).

Modifications to the Joel-Cohen method abound. For emergency delivery, we begin along a line somewhat lower on the abdomen. For speed, we extend the fascial incision bluntly by hooking index fingers in the fascial incision's lateral angles and pulling laterally (Hofmeyr, 2009; Oloffson, 2015). Index fingers insinuated between the rectus bellies then move cephalocaudad in opposition to stretch the incision. Blunt index-finger dissection enters

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the peritoneum, and again, cranial and caudad opposing stretch opens this layer. Last, all the layers of the abdominal wall are grasped manually and pulled laterally in opposition to further open the operating space.

These techniques have been associated with shorter operative times and with lower rates of intraoperative blood loss and postoperative pain (Mathai, 2013). They may, however, prove difficult for women with anterior rectus fibrosis and peritoneal adhesions (Bolze, 2013).

Classical Cesarean Incision

Indications

This incision is usually avoided because it encompasses the active upper uterine segment and thus is prone to rupture with subsequent pregnancies. Some indications stem from difficulty in exposing or safely entering the lower uterine segment. For example, a densely adhered bladder from previous surgery is encountered; a *leiomyoma* occupies the lower uterine segment; the cervix has been invaded by cancer; or massive maternal obesity precludes safe access to the lower uterine segment. A classical incision is also preferred for placenta previa with anterior implantation, especially those complicated by placenta accrete syndromes. In extreme cases of this, the typical classical hysterotomy may be placed even higher in the uterine body or posteriorly to avoid the placenta. As such, fetuses with cephalic presentation are then delivered in a manner similar to total breech extraction (Chap. 28, Total Breech Extraction).

In other instances, fetal indications dictate the need. *Transverse lie of a large fetus*, especially if the membranes are ruptured and the shoulder is impacted in the birth canal, usually necessitates a classical incision. A fetus presenting as a back-down transverse lie is particularly difficult to deliver through a transverse uterine incision. In instances when the fetus is very small and breech, a classical incision may be preferable (Osmundson, 2013). In such cases, the poorly developed lower uterine segment provides inadequate space for the manipulations required for breech delivery. Or, less commonly, the small fetal head may become entrapped by a contracting uterine fundus following membrane rupture. Last, with multiple fetuses, a classical incision again may provide suitable room for extraction of fetuses that may be malpositioned or preterm (Osmundson, 2015).

Uterine Incision and Repair

A vertical uterine incision is initiated with a scalpel beginning as low as possible and preferably within the lower uterine segment (Fig. 30-11). If adhesions, insufficient exposure, a tumor, or placenta percreta preclude development of a bladder flap, then the incision is made above the level of the bladder. Once the uterus is entered with a scalpel, the incision is extended cephalad with bandage scissors until it is long enough to permit delivery of the fetus. With scissor use, the fingers of the nondominant hand are insinuated between the myometrium and fetus to prevent fetal laceration. As the incision is opened, numerous large vessels that bleed profusely are commonly encountered within the myometrium. The remainder of fetal and placental delivery mirrors that with a low transverse hysterotomy.

FIGURE 30-11

An initial small vertical hysterotomy incision is made in the lower uterine segment. Fingers are insinuated between the myometrium and fetus to avoid fetal laceration. Scissors extend the incision cephalad as needed for delivery. (Reproduced with permission from Johnson DD: Cesarean delivery. In Yeomans ER, Hoffman BL, Gilstrap LC III, et al (eds): Cunningham and Gilstrap's Operative Obstetrics, 3rd ed. New York, McGraw-Hill Education, 2017.)

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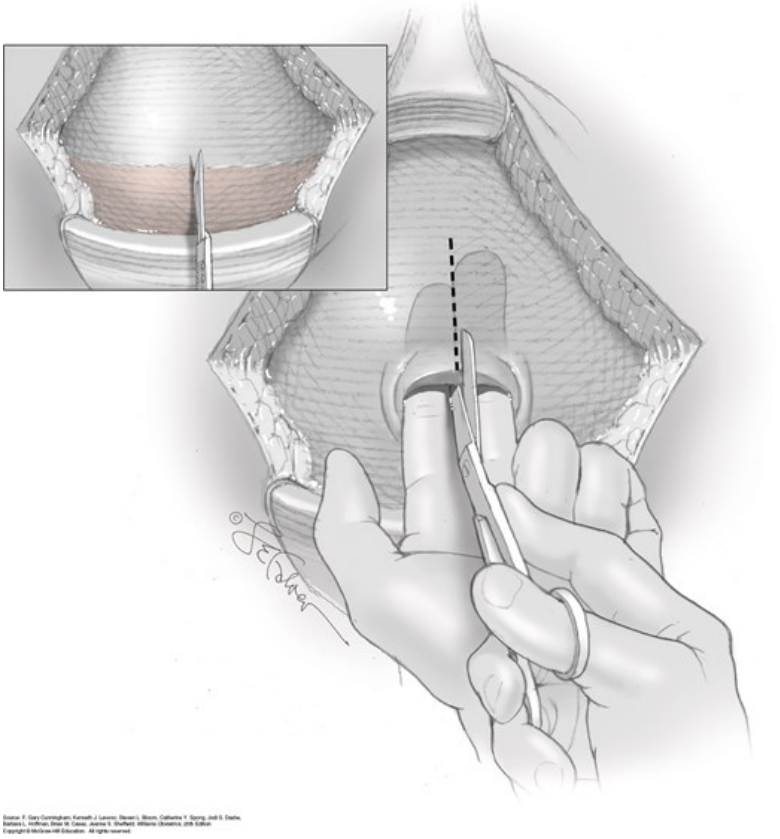
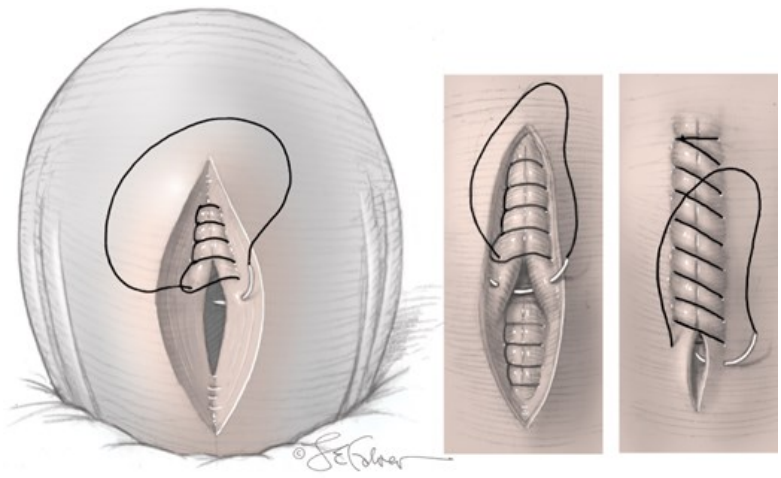


For incision closure, one method employs a layer of 0- or no. 1 chromic catgut with a running stitch to approximate the deeper length of the incision (Fig. 30-12). The outer layer of myometrium is then closed along its length with similar suture and with a running suture line. To achieve good approximation and to prevent the suture from tearing through the myometrium, it is helpful to have an assistant compress the uterus on each side of the wound toward the midline as each stitch is placed.

FIGURE 30-12

Classical incision closure. The deeper half (*left*) and superficial half (*middle*) of the incision are closed in a running fashion. The serosa is then closed (*right*). (Reproduced with permission from Johnson DD: Cesarean delivery. In Yeomans ER, Hoffman BL, Gilstrap LC III, et al (eds): Cunningham and Gilstrap's Operative Obstetrics, 3rd ed. New York, McGraw-Hill Education, 2017.)



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PERIPARTUM HYSTERECTOMY

Indications

Hysterectomy is most commonly performed to arrest or prevent hemorrhage from intractable uterine atony or abnormal placentation (Bateman, 2012; Hernandez, 2012; Owolabi, 2013). It is more often completed during or after cesarean delivery but may be needed following vaginal birth. If all deliveries are considered, the peripartum hysterectomy rate in the United States approximates 1 per 1000 births and has risen significantly during the past few decades (Bateman, 2012; Govindappagari, 2016). During a 25-year period, the rate of peripartum hysterectomy at Parkland Hospital was 1.7 per 1000 births (Hernandez, 2012). Most of this rise is attributed to the increasing rates of cesarean delivery and its associated complications in subsequent pregnancy (Bateman, 2012; Bodelon, 2009; Flood, 2009; Orbach, 2011). Of hysterectomies, approximately one half to two thirds are total, whereas the remaining cases are supracervical (Rossi, 2010; Shellhaas, 2009).

Major complications of peripartum hysterectomy include greater blood loss and risk of urinary tract damage. Blood loss is usually appreciable because hysterectomy is being performed for hemorrhage that frequently is torrential, and the procedure itself is associated with substantial bleeding. Although many cases with hemorrhage cannot be anticipated, those with abnormal implantation are often identified antepartum. Preoperative preparations for placenta accreta are discussed in Chapter 41 (Management) and have also been outlined by the Society for Maternal-Fetal Medicine (2010) and American College of Obstetricians and Gynecologists (2017c).

An important factor affecting the cesarean hysterectomy complication rate is whether the operation is performed electively or emergently. With anticipated or planned cesarean hysterectomy, rates of blood loss, blood transfusion, and urinary tract complications are lower that with emergent procedures (Briery, 2007; Glaze, 2008).

Hysterectomy Technique

Total or supracervical hysterectomy is performed using standard operative techniques. Adequate exposure is essential, but initially, placement of a self-retaining retractor such as a Balfour is not necessary. Rather, satisfactory exposure is obtained with cephalad traction on the uterus by an assistant, along with handheld Richardson or Deaver retractors. The bladder flap is deflected downward to the level of the cervix if possible to permit total hysterectomy. In cases in which cesarean hysterectomy is planned or strongly suspected, extended bladder flap dissection is ideally completed before initial hysterotomy. Later attempts at bladder dissection may be obscured by bleeding, or excess blood may be lost while this dissection is performed.

After cesarean delivery, the placenta is typically removed. In cases of placenta accrete syndrome for which hysterectomy is already planned, the placenta is usually left undisturbed in situ. In either situation, if the hysterotomy incision is bleeding appreciably, it can be sutured or Pennington or sponge forceps can be applied for hemostasis. If bleeding is minimal, neither maneuver is necessary.

The round ligament is divided close to the uterus between clamps, and each pedicle is ligated (Fig. 30-13). Either 0 or no. 1 suture can be used in either chromic gut or delayed-absorbable material. The anterior leaf of the broad ligament is incised downward to meet the former bladder flap incision. The posterior leaf of the broad ligament adjacent to the uterus is bluntly or sharply perforated just beneath the fallopian tube, uteroovarian ligament, and ovarian vessels (Fig. 30-14). These structures together are then divided between sturdy clamps placed close to the uterus (Fig. 30-15). The lateral pedicle is doubly ligated. The medial clamp remains and is removed later with the entire uterine specimen. The posterior leaf of the broad ligament is incised toward the uterosacral ligaments (Fig. 30-16). Next, the bladder and attached peritoneal flap are further deflected and dissected as needed. If the bladder flap is unusually adhered, as it may be after previous hysterotomy incisions, careful sharp dissection may be necessary (Fig. 30-17).

FIGURE 30-13

The round ligaments are clamped, doubly ligated, and transected bilaterally.

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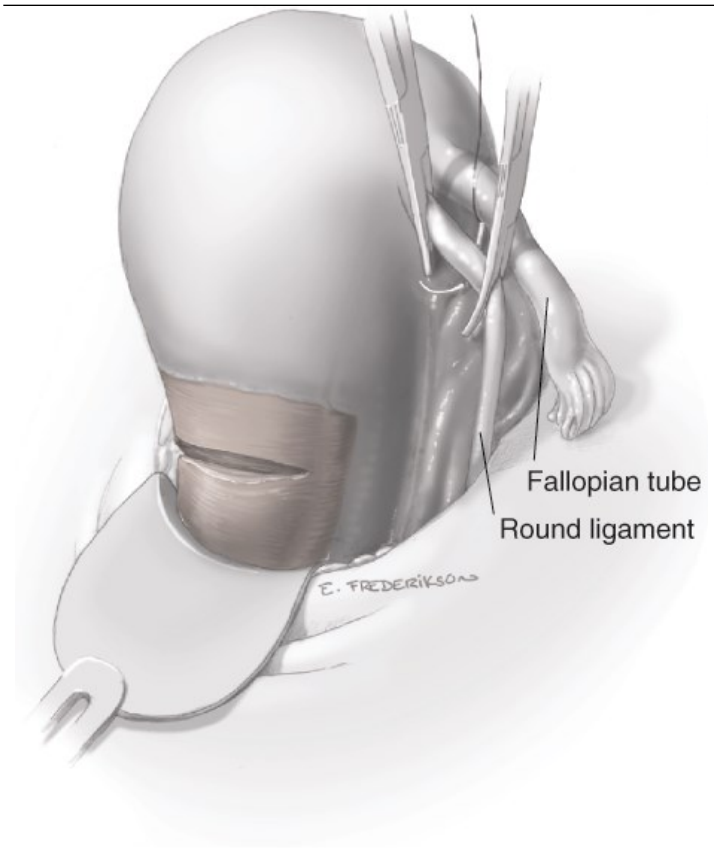

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FIGURE 30-14

The posterior leaf of the broad ligament adjacent to the uterus is perforated just beneath the fallopian tube, uteroovarian ligaments, and ovarian vessels.

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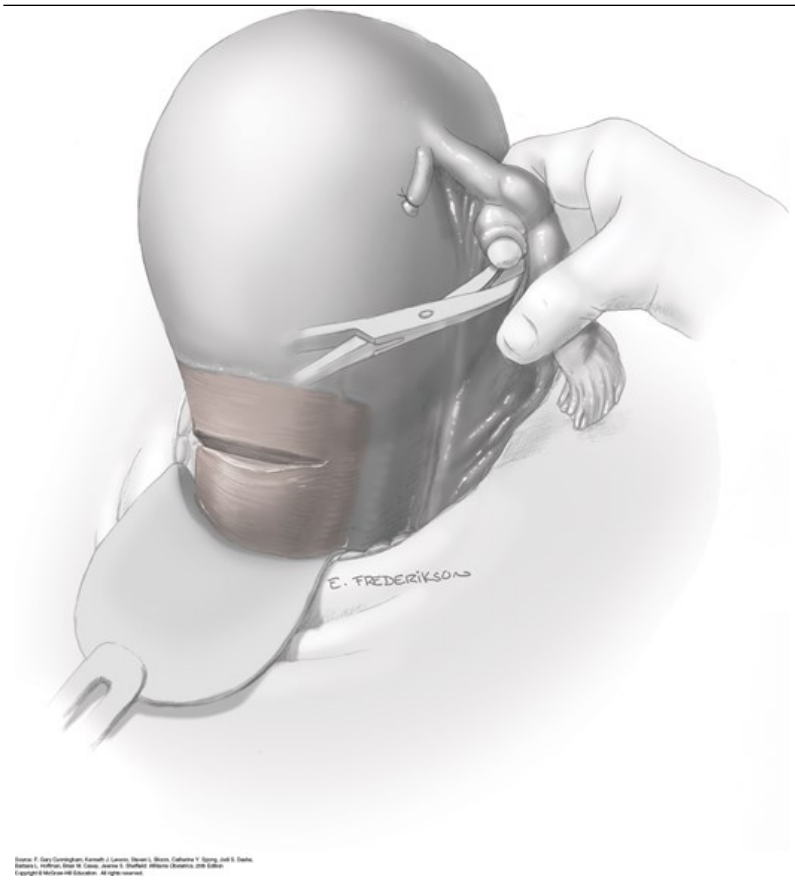

FIGURE 30-15

The uteroovarian ligament and fallopian tube are clamped and cut. The lateral pedicle is doubly ligated.

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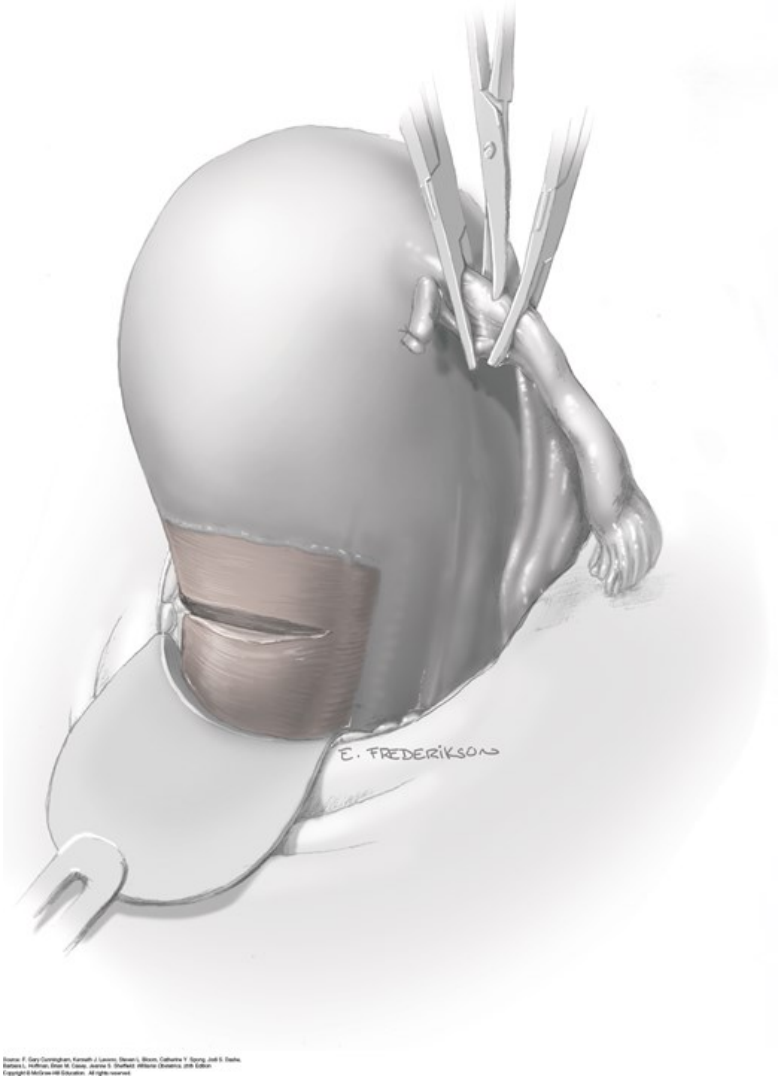

FIGURE 30-16

The posterior leaf of the broad ligament is divided inferiorly toward the uterosacral ligament.

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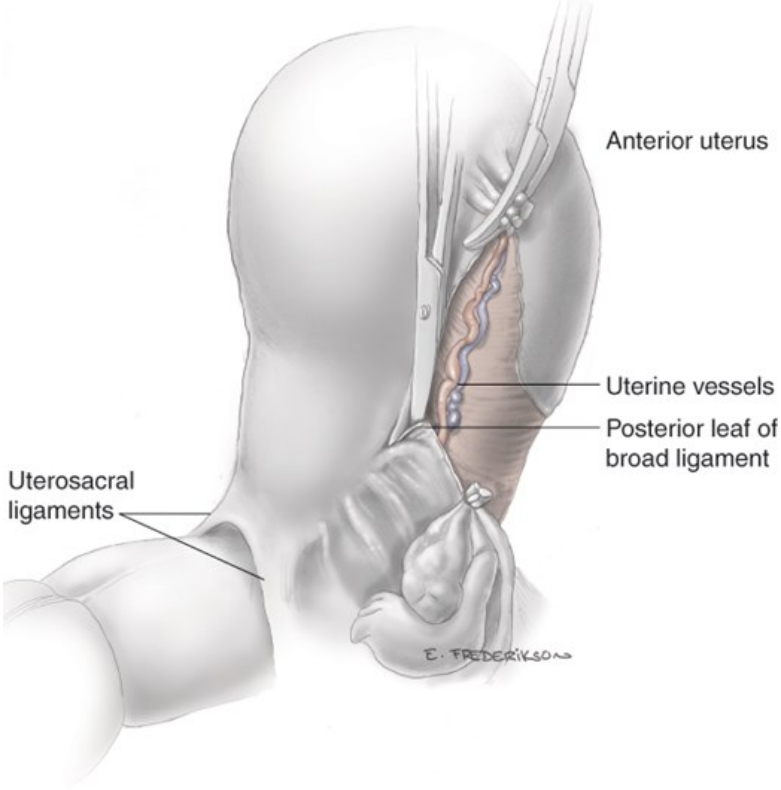

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FIGURE 30-17

The bladder is dissected sharply from the lower uterine segment.

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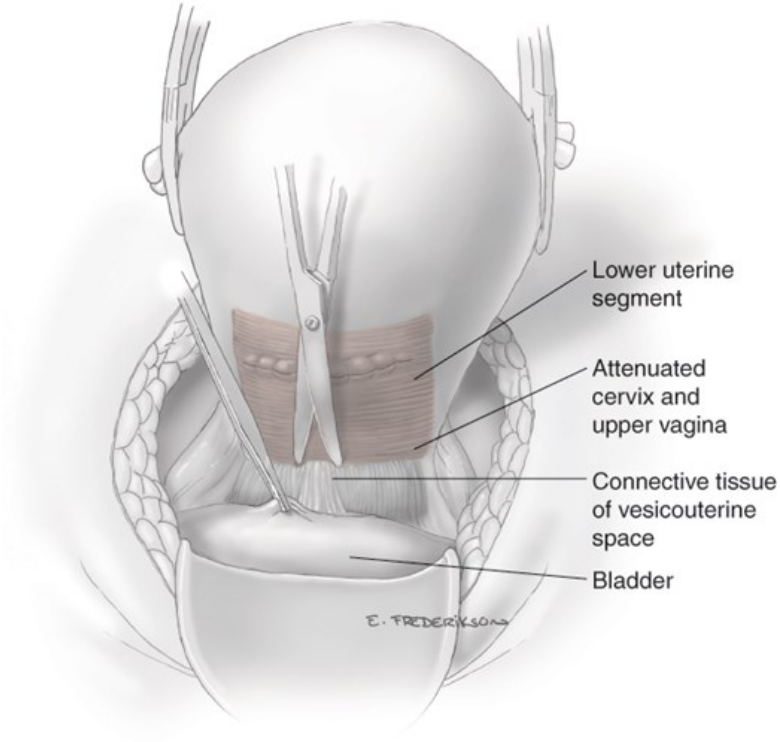

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Special care is required from this point on to avoid injury to the ureters, which pass beneath the uterine arteries. To help accomplish this, an assistant places constant traction to pull the uterus in the direction away from the side on which the uterine vessels are being ligated. The ascending uterine artery and veins on either side are identified. These vessels are then clamped adjacent to the uterus. For security, some may prefer two lateral clamps as shown in Figure 30-18. The most medial clamp helps prevents back bleeding from the uterus and remains for later removal with the specimen. The uterine vessels are divided, and the lateral tissue pedicle is doubly suture ligated. After securing the uterine vessels on one side, the round ligament, adnexal pedicle, and uterine vessels are then addressed on the contralateral side.

FIGURE 30-18

The uterine vessels are clamped, and a third medial clamp helps prevent “back bleeding.” Once divided, the lateral vascular pedicle is doubly ligated to ensure hemostasis.

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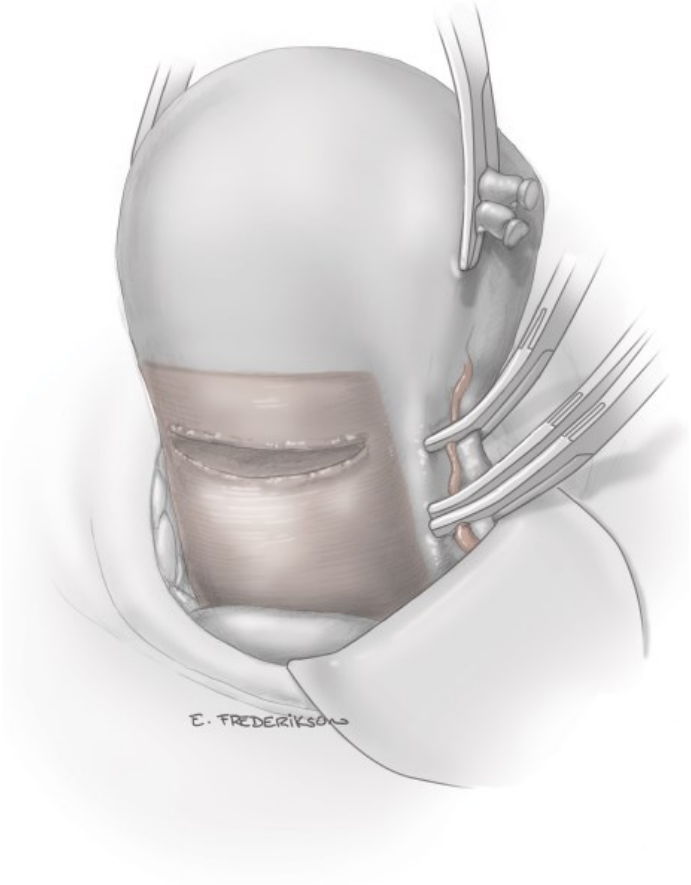

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With cesarean hysterectomy, it may be more advantageous in cases of profuse hemorrhage to rapidly double clamp and divide all of the vascular pedicles between clamps to gain hemostasis. The surgical team can then return to ligate all of the pedicles.

Total Hysterectomy

Even if total hysterectomy is planned, we find it technically easier in many cases to finish the operation after amputating the uterine fundus and placing Ochsner or Kocher clamps on the cervical stump for traction and hemostasis. Self-retaining retractors also may be placed at this time. To remove the cervix, the bladder is mobilized further if needed. This carries the ureters caudad as the bladder is retracted beneath the symphysis and will prevent laceration or suturing of the bladder during cervical excision and vaginal cuff closure.

The cardinal ligament, the uterosacral ligaments, and the many large vessels these ligaments contain are clamped systematically with sturdy Heaney-type curved or straight clamps (Fig. 30-19). The clamps are placed as close to the cervix as possible, taking care not to include excessive tissue in each clamp. The tissue between the pair of clamps is incised, and the lateral pedicle is suture ligated. These steps are repeated caudally and bilaterally until the level of the lateral vaginal fornix is reached on each side. In this way, the descending branches of the uterine vessels are clamped, cut, and ligated as the cervix is separated from the cardinal ligaments.

FIGURE 30-19

The cardinal ligaments are clamped, incised, and ligated.

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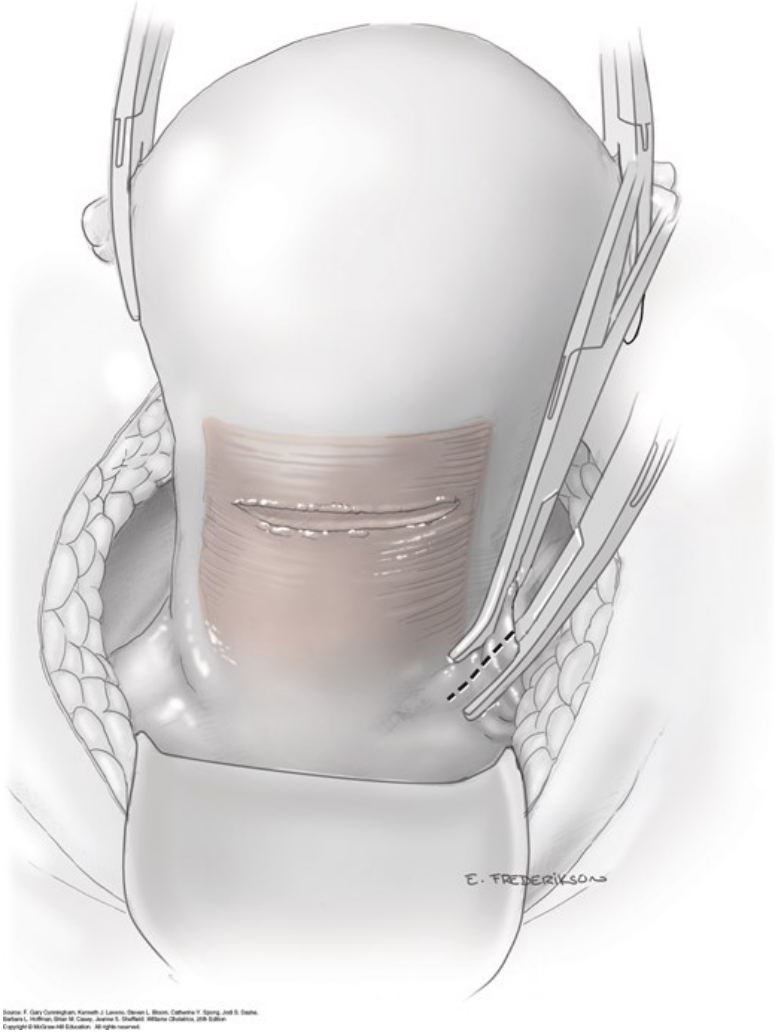

If the cervix is effaced and dilated considerably, its softness may obscure palpable identification of the cervicovaginal junction. The junction location can be ascertained through a vertical uterine incision made anteriorly in the midline, either through the open hysterotomy incision or through an incision created at the level of the ligated uterine vessels. A finger is directed inferiorly through the incision to identify the free margin of the dilated, effaced cervix. The contaminated glove is replaced. Another useful method to identify the cervical margins in cases of planned hysterectomy is to transvaginally place four metal skin clips or brightly colored sutures at 12, 3, 6, and 9 o'clock positions on the cervical edges.

Immediately below the level of the cervix, a curved clamp is placed across the lateral vaginal fornix on each side, and the vagina is incised above the clamp (Fig. 30-20). The cervix is inspected to ensure that it has been completely removed. A transfixing suture is used for vaginal cuff closure as each clamp is removed. Interrupted stitches may be added to approximate the middle portion of the cuff. Each lateral vaginal fornix is secured to the uterosacral ligaments to mitigate later vaginal prolapse. For cuff closure, some surgeons instead prefer to close the vagina by apposing the anterior and posterior vaginal walls with interrupted figure-of-eight sutures or running suture line (Fig. 30-21).

FIGURE 30-20

A curved clamp is placed across the lateral vaginal fornix below the level of the cervix, and the tissue incised medially to the point of the clamp.

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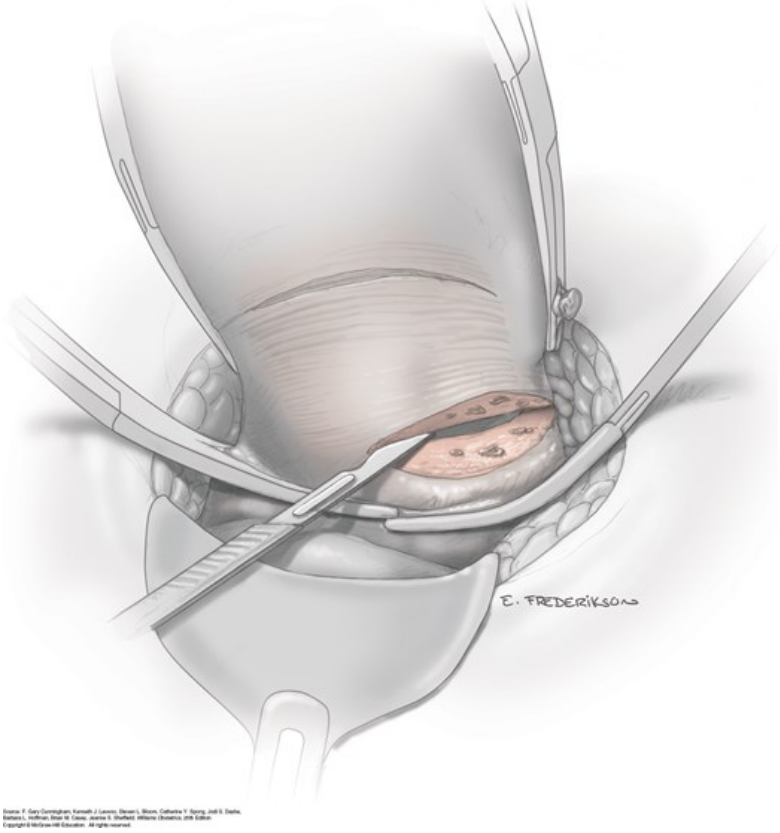

FIGURE 30-21

A running-lock suture approximates the vaginal wall edges.

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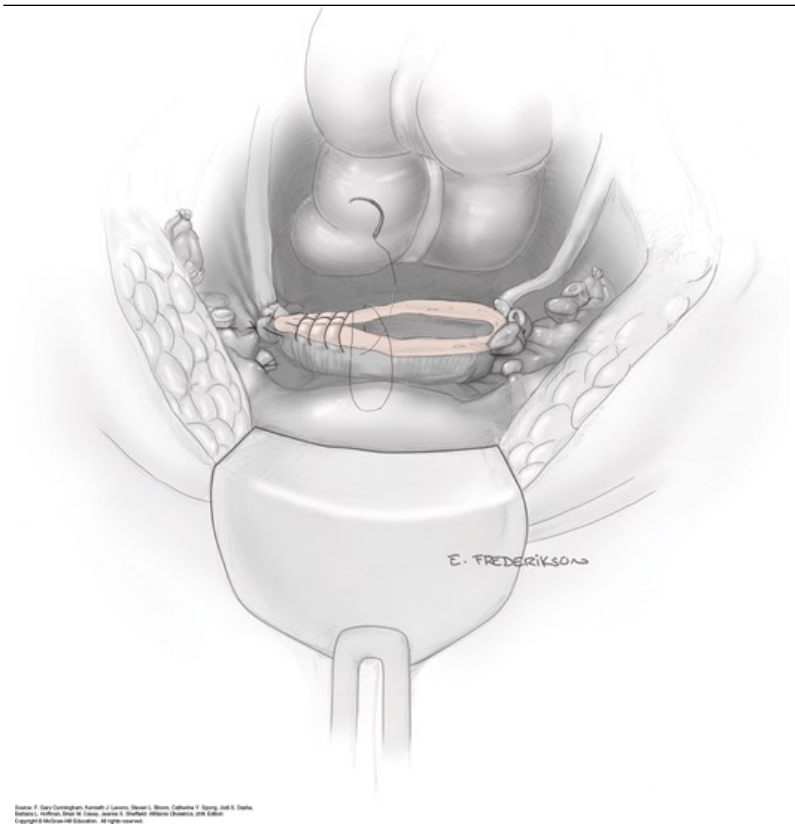

All sites are examined carefully for bleeding. One technique is to perform a systematic bilateral survey from the fallopian tube and ovarian ligament pedicles to the vaginal vault and bladder flap. Bleeding sites are ligated with care to avoid the ureters. The abdominal wall normally is closed in layers, as previously described for cesarean delivery (Adhesions).

Supracervical Hysterectomy

To perform a subtotal hysterectomy, the uterine body is amputated immediately above the level of uterine artery ligation. The cervical stump may be closed with continuous or interrupted chromic catgut suture. Subtotal hysterectomy is often all that is necessary to stop hemorrhage. It may be preferred for women who would benefit from a shorter surgery or for those with extensive adhesions that threaten significant urinary tract injury.

Salpingo-oophorectomy

Because of the large adnexal vessels and their close proximity to the uterus, it may be necessary to remove one or both adnexa to obtain hemostasis. Briery and colleagues (2007) reported unilateral or bilateral oophorectomy in a fourth of cases. Preoperative counseling for anticipated hysterectomy should include this possibility.

Urinary Tract or Bowel Injury

These injuries are rare during cesarean delivery. The bladder laceration rate approximates 2 per 1000 cesarean deliveries, whereas that for ureteral trauma nears 0.3 per 1000 cases (Güngördük, 2010; Oliphant, 2014; Rajasekar, 1997). Bowel is damaged in about 1 in 1000 cesarean deliveries (Silver, 2006).

Cystotomy

Bladder laceration most commonly occurs during blunt or sharp dissection in the vesicouterine space to create the bladder flap, during peritoneal cavity entry, and during hysterotomy (Phipps, 2005; Rahman, 2009). Risks are prior cesarean delivery; emergency cesarean delivery; comorbid adhesive disease; cesarean hysterectomy, especially cases with morbidly adherent placenta; and surgery in second-stage labor compared with first-stage (Alexander, 2007; Silver, 2006; Yossepowitch, 2004).

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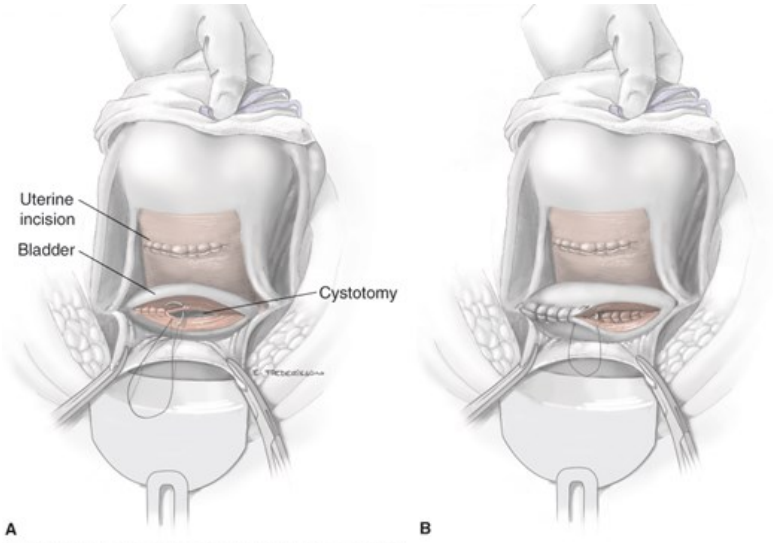
Bladder injury is typically identified intraoperatively, and initially, a clear-fluid gush or the Foley bulb may be seen. If cystotomy is suspected, it can be confirmed with retrograde instillation of infant formula or methylene-blue-stained saline through a Foley catheter into the bladder. Leakage of opaque milk or methylene blue aids in identification of the laceration as well as delineation of its borders. The dome is lacerated in 95 percent of cases, and injuries at the trigone form the remainder (Phipps, 2005).

Prior to cystotomy repair, ureters are examined, and surveillance for urine jets from each orifice follows. This can be done directly through the cystotomy, if at the dome, or through a separate diagnostic extraperitoneal or retropubic cystotomy, if injury nears the trigone. Jet visualization can be assisted by 50 mg of methylene blue administered intravenously.

Once ureteral patency is confirmed, the bladder may be closed with a two- or three-layer running closure using a 3–0 absorbable or delayed-absorbable suture (Fig. 30-22). The first layer inverts the mucosa into the bladder. The bladder is then filled with a marker fluid to demonstrate integrity of the repair. Leaking defects can be closed with interrupted reinforcing stitches. Subsequent layers reapproximate the bladder muscularis. Postoperative care requires continuous bladder drainage for 7 to 14 days to permit healing and minimize the risk of fistula formation. Uropathogen prophylaxis during this drainage is not required. Also, cystourethrography need not be routinely performed prior to catheter removal for a simple, single laceration (Davis, 1999).

FIGURE 30-22

Cystotomy repair. **A.** The primary layer inverts the bladder mucosa with running or interrupted sutures of 3–0 delayed-absorbable or absorbable suture. **B.** Second and possibly a third layer approximate the bladder muscularis to reinforce the incision closure.



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Larger lacerations in or near the trigone require careful attention. Specialists may be consulted, and in preparation, ureteral stents can be assembled. In these cases, ureteral orifices are directly inspected to document jets from both. If not seen, then stents may be passed through the cystotomy and into each orifice to confirm patency. Once this is confirmed, repair should not disrupt the ureteral orifices, and stents may remain to ensure ureteral patency.

Unrepaired cystotomy can manifest as hematuria, oliguria, abdominal pain, ileus, ascites, peritonitis, fever, urinoma, or fistula. For diagnosis, retrograde cystography or abdominal computed tomography (CT) with cystography can be used (Tarney, 2013). Cystoscopy is also an option but may require an operating room. Once identified, prompt repair is indicated (Balgobin, 2017).

Ureteral Injury

These injuries occur most often during repair of hysterotomy extensions into the broad ligament or vagina (Eisenkop, 1982). If ureteral injury is suspected, methylene blue is administered. The pelvis is directly inspected for dye extravasation, which suggests ureteral transection. Next, brisk dye-

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stained urine jets are sought from each orifice to exclude ureteral kinking or ligation. Orifice viewing may be via cystoscopy, if available; through a comorbid traumatic cystotomy; or through a diagnostic cystotomy. With sluggish or absent jets, consultation with a specialist is typically requested. A ureteral catheter is first threaded to identify a potential obstruction site and guide ureterolysis. Kinked or ligated ureters can be relieved by release of ensnaring sutures. Crush injuries are inspected to ensure vital tissue. In these cases, stents are left to avert ureteral stricture. A Foley catheter remains for 7 to 10 days, and the ureteral catheters are removed via cystoscopy after 14 days. Intravenous pyelography (IVP) is usually not necessary before removal of the stent if it was placed as a precautionary measure after relatively minor injury (Davis, 1999).

Crush injuries with devascularization, thermal injury, or transection require more extensive repair. If a healthy-appearing ureter can be reimplanted into the bladder without undue tension, then ureteroneocystostomy is preferable. For more proximal injuries, ureteroureterostomy, psoas hitch, or Boari flap creation may be needed. An explanation of these more extensive procedures is found in *Cunningham and Gilstrap's Operative Obstetrics*, 3rd edition (Balgobin, 2017).

Unrecognized ureteral injury can mimic those of cystotomy with the addition of possible costovertebral angle tenderness. CT urography is a preferred initial diagnostic tool (Sharp, 2016). The duration of time from injury to identification directs repair. Those identified early are often suitable for immediate repair.

Bowel Injury

Serosal tears represent weak points in the small bowel. If obstruction develops postoperatively, these weak spots may perforate, leading to peritonitis. If serosal tears are few in number, they can be oversewn with either a fine absorbable or nonabsorbable suture (Davis, 1999). More significant lacerations are often repaired in consultation with a general surgeon or gynecologic oncologist.

POSTOPERATIVE CARE

Euvolemia Evaluation

During and after cesarean delivery, requirements for intravenous fluids can vary considerably. Administered fluids consist of either lactated Ringer solution or a similar crystalloid solution with 5-percent dextrose. Typically, at least 2 L is infused during surgery. Blood loss with uncomplicated cesarean delivery approximates 1000 mL. The average-sized woman with a hematocrit of 30 percent or more and with a normally expanded blood and extracellular fluid volume most often will tolerate blood loss up to 2000 mL without difficulty. Unappreciated bleeding through the vagina during the procedure, bleeding concealed in the uterus after its closure, or both commonly lead to underestimation.

Blood loss averages 1500 mL with elective cesarean hysterectomy, although this is variable (Pritchard, 1965). Most peripartum hysterectomies are unscheduled, and blood loss in these cases is correspondingly greater. Thus, in addition to close monitoring of vital signs and urine output, the hematocrit should be determined intra- or postoperatively as indicated.

Recovery Suite

The amount of vaginal bleeding is closely monitored for at least an hour in the immediate postoperative period. The uterine fundus is also identified frequently by palpation to ensure that the uterus remains firmly contracted. Unfortunately, as conduction analgesia fades or the woman awakens from general anesthesia, abdominal palpation is likely to produce pain. A patient-controlled analgesia (PCA) pump can be effective. Once regional analgesia begins to fade or the woman becomes fully awake following general anesthesia, criteria for transfer to the postpartum ward include minimal bleeding, stable vital signs, and adequate urine output.

Hospital Care until Discharge

Analgesia, Vital Signs, Intravenous Fluids

Several schemes are suitable for postoperative pain control. One PCA regimen uses intravenous morphine given as needed as a 1-mg dose with a 6-minute lockout interval and maximum dose of 30 mg in 4 hours. An additional 2-mg booster dose is permitted for a maximum of 2 doses. Alternatively, intramuscular (IM) meperidine, 50 to 75 mg every 3 to 4 hours, or IM morphine, 10 to 15 mg every 3 to 4 hours, is suitable. In a trial using these options, Yost and associates (2004) found that morphine provided superior pain relief to meperidine and was associated with significantly higher rates of

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breastfeeding and continuation of newborn rooming in. Breastfeeding can be initiated the day of surgery. If the mother elects not to breastfeed, a binder that supports the breasts without marked compression usually will minimize discomfort.

After transfer to her room, the woman is assessed at least hourly for 4 hours, and thereafter at intervals of 4 hours. Deep breathing and coughing are encouraged to prevent atelectasis. Vital signs, uterine tone, urine output, and bleeding are evaluated. The hematocrit is routinely measured the morning after surgery. It is checked sooner if there was unusual blood loss or if there is hypotension, tachycardia, oliguria, or other evidence to suggest hypovolemia. If the hematocrit is decreased significantly from the preoperative level, the measurement is repeated and a search is instituted to identify the cause. If the hematocrit stabilizes, the mother can be allowed to ambulate, and if there is little likelihood of further blood loss, iron therapy is preferred to transfusion.

Postpartum, the patient begins to mobilize and excrete her physiologically expanded extravascular volume. Thus, maintenance intravenous fluid proves adequate after surgery until consistent oral intake is reestablished. If urine output falls below 30 mL/hr, however, the woman should be reevaluated promptly. The cause of the oliguria can range from unrecognized blood loss to an antidiuretic effect from infused oxytocin.

Women undergoing unscheduled cesarean delivery may have pathological retention or constriction of the extracellular fluid compartment caused by severe preeclampsia, sepsis syndrome, vomiting, prolonged labor without adequate fluid intake, or increased blood loss. Women with these complications are generally observed in the recovery room until stabilization is assured.

Bladder and Bowel Function

The Foley catheter most often can be removed by 12 hours postoperatively, or more conveniently, the morning after surgery. The prevalence of urinary retention following cesarean delivery approximates 3 to 7 percent (Chap. 36, Perineal Care). Failure to progress in labor and postoperative narcotic analgesia are identified risks (Chai, 2008; Kandadai, 2014; Liang, 2007).

In uncomplicated cases, liquids or solid food may be offered within hours of surgery and advanced as tolerated (Guo, 2015). Some degree of adynamic ileus follows virtually every abdominal operation, but in most cases of cesarean delivery, it is negligible. Postoperative ileus symptoms include abdominal distention, gas pains, and an inability to pass flatus or stool. With persistent nausea and vomiting or with prolonged bowel function delay, radiological imaging may aid exclusion of bowel obstruction. A plain abdominal radiograph is a frequent first choice. However, in the general population, this study is diagnostic in only 50 to 60 percent of small bowel obstruction cases (Maglinte, 1997). Thus, a radiograph may best serve as a triage tool in cases in which ileus is the suspected diagnosis. Notably, an enlarged postpartum uterus can compress the rectosigmoid and prevent it from filling with gas. Thus, findings suggesting a distal colonic obstruction may confuse true cases of transient ileus (Kammen, 2000). In comparison, CT with intravenous contrast provides greater accuracy for small bowel obstruction. Oral contrast is concurrently given when SBO is a consideration (Katz, 2013). Last, although uncommon, an unrecognized bowel injury may be responsible for otherwise unexplained fever and poor bowel function. Here, CT may be most diagnostic of potential etiologies.

As treatment of ileus, intravenous fluids compensate for poor oral intake and losses from emesis. Electrolyte imbalances are corrected to improve smooth muscle activity and avoid bowel edema. Nasogastric decompression is necessary only with persistent vomiting or severe distention.

For prevention, intraoperative goals strive to minimize bowel manipulation, avoid excess intravenous fluids or profound hypovolemia, and limit surgery length (Bragg, 2015). Postoperatively, gum chewing enhances early bowel function recovery by nearly 7 hours after cesarean delivery (Zhu, 2014). Among studies, chewing was initiated immediately or up to 12 hours later, lasted 15 to 60 minutes, and was repeated in at least three sessions daily (Pereira Gomes Morais, 2016).

Ambulation and Wound Care

As discussed earlier, women undergoing cesarean delivery have an increased risk of venous thromboembolism compared with those delivering vaginally. Early ambulation lowers the thromboembolism risk. Walking to the bathroom begins, initially with assistance. Brief walks are encouraged, and ambulation can be timed so that a recently administered analgesic will minimize discomfort.

Although not evidence based, we remove the surgical dressing after 24 hours and inspect the incision daily. One small randomized trial showed no wound healing differences if removed at 6 hours (Peleg, 2016). By the third postpartum day, showering is not harmful to the incision. Prior to this, a plastic cover can maintain dryness during showers. If used, staples often are removed on the fourth day. Once removed, dressing strips (Steri-Strips)

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can be placed as needed for 1 week to reinforce skin edge integrity. If there is concern for superficial wound separation, staples remain in place for 7 to 10 days.

Hospital Discharge

For uncomplicated cesarean delivery, the average hospitalization length is three to four days (Buie, 2010). Data from studies suggest that earlier discharge is feasible for properly selected women and newborns (Bayoumi, 2016; Tan, 2012). Protocols ideally include earlier reevaluation for neonatal jaundice.

Activities during the first week should be restricted to self-care and newborn care with assistance. Driving can be resumed when pain does not limit the ability to brake quickly and when narcotic medications are not in use. In women with cesarean delivery, intercourse was resumed in 44 percent by 6 weeks postpartum, in 81 percent by 3 months, and 97 percent at 1 year (McDonald, 2013). After the puerperium, the quality of sexual functioning does not differ between those undergoing spontaneous vaginal delivery or cesarean (Chang, 2015; Fehniger, 2013; Rogers, 2014). Return to work is variable. Six weeks is commonly cited, although many women use the Family and Medical Leave Act to allow up to 12 weeks for recovery and newborn bonding.

REFERENCES

Abdel-Aleem H, Aboelnasr MF, Jayousi TM, et al: Indwelling bladder catheterisation as part of intraoperative and postoperative care for caesarean section. Cochrane Database Syst Rev 4:CD010322, 2014

Ahmadzia HK, Patel EM, Joshi D, et al: Obstetric surgical site infections: 2 grams compared with 3 grams of cefazolin in morbidly obese women. Obstet Gynecol 126(4):708, 2015 [PubMed: 26348186]

Alanis MC, Villers MS, Law TL, et al: Complications of cesarean delivery in the massively obese parturient. Am J Obstet Gynecol 203(3):271.e1, 2010

Alexander JM, Leveno KJ, Hauth J, et al: Fetal injury associated with cesarean delivery. Obstet Gynecol 108(4):885, 2006 [PubMed: 17012450]

Alexander JM, Leveno KJ, Rouse DJ, et al: Comparison of maternal and infant outcomes from primary cesarean delivery during the second compared with first stage of labor. Obstet Gynecol 109(4):917, 2007 [PubMed: 17400854]

American Academy of Pediatrics, American College of Obstetricians and Gynecologists: Guidelines for Perinatal Care, 8th ed. Elk Grove Village, AAP, 2017

American College of Obstetricians and Gynecologists: Scheduling planned cesarean delivery. Patient Safety Checklist No. 3, December 2011

American College of Obstetricians and Gynecologists: Patient safety in the surgical environment. Committee Opinion No. 464, September 2010, Reaffirmed 2014a

American College of Obstetricians and Gynecologists: Preoperative planned cesarean delivery. Patient Safety Checklist No. 4, December 2014b

American College of Obstetricians and Gynecologists: Informed consent. Committee Opinion No. 439, August 2009, Reaffirmed 2015

American College of Obstetricians and Gynecologists: Prophylactic antibiotics in labor and delivery. Practice Bulletin No. 120, June 2011, Reaffirmed 2016

American College of Obstetricians and Gynecologists: Cesarean delivery on maternal request. Committee Opinion No. 559, April 2013, Reaffirmed 2017a

American College of Obstetricians and Gynecologists: Optimizing support for breastfeeding as part of obstetric practice. Committee Opinion No. 658, February 2016, Reaffirmed 2017b

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CHAPTER 30: Cesarean Delivery and Peripartum Hysterectomy,
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American College of Obstetricians and Gynecologists: Placenta accreta. Committee Opinion No. 529, July 2012, Reaffirmed 2017c

American College of Obstetricians and Gynecologists: Thromboembolism in pregnancy. Practice Bulletin No. 123, September 2011, Reaffirmed 2017d

American College of Obstetricians and Gynecologists: Vaginal seeding. Committee Opinion No. 725, November 2017e

American Society of Anesthesiologists: Task Force on Obstetrical Anesthesia: practice guidelines for obstetrical anesthesia. Anesthesiology 124:270, 2016 [PubMed: 26580836]

Andrews WW, Hauth JC, Cliver SP, et al: Randomized clinical trial of extended spectrum antibiotic prophylaxis with coverage for *Ureaplasma urealyticum* to reduce post-cesarean delivery endometritis. Obstet Gynecol 101(6):1183, 2003 [PubMed: 12798523]

Anorlu RI, Maholwana B, Hofmeyr GJ: Methods of delivering the placenta at caesarean section. Cochrane Database Syst Rev 3:CD004737, 2008

Asıcıoğlu O, Güngördük K, Asıcıoğlu BB, et al: Unintended extension of the lower segment uterine incision at cesarean delivery: a randomized comparison of sharp versus blunt techniques. Am J Perinatol 31(10):837, 2014 [PubMed: 24347261]

Atherton N, Parsons SJ, Mansfield P: Attendance of paediatricians at elective Caesarean sections performed under regional anaesthesia: is it warranted? J Paediatr Child Health 42(6):332, 2006 [PubMed: 16737472]

Avila C, Bhangoo R, Figueroa R, et al: Association of smoking with wound complications after cesarean delivery. J Matern Fetal Neonatal Med 25(8):1250, 2012 [PubMed: 22081871]

Baksu A, Kalan A, Ozkan A, et al: The effect of placental removal method and site of uterine repair on postcesarean endometritis and operative blood loss. Acta Obstet Gynecol Scand 84(3):266, 2005 [PubMed: 15715535]

Balgobin S: Urologic and gastrointestinal injuries. In Yeomans ER, Hoffman BL, Gilstrap LC III, et al (eds): Cunningham and Gilstrap's Operative Obstetrics, 3rd ed. New York, McGraw-Hill Education, 2017

Barber EL, Lundsberg LS, Belanger K, et al: Indications contributing to the increasing cesarean delivery rate. Obstet Gynecol 118(1):29, 2011 [PubMed: 21646928]

Basha SL, Rochon ML, Quiñones JN, et al: Randomized controlled trial of wound complication rates of subcuticular suture vs staples for skin closure at cesarean delivery. Am J Obstet Gynecol 203(3):285.e1, 2010

Bateman BT, Mhyre JM, Callaghan WM, et al: Peripartum hysterectomy in the United States: nationwide 14 year experience. Am J Obstet Gynecol 206(1):63.e1, 2012

Bates SM, Greer IA, Middeldorp S, et al: VTE, thrombophilia, antithrombotic therapy, and pregnancy: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. Chest 141(2 Suppl):e691S, 2012 [PubMed: 22315276]

Bayoumi YA, Bassiouny YA, Hassan AA, et al: Is there a difference in the maternal and neonatal outcomes between patients discharged after 24 h versus 72 h following cesarean section? A prospective randomized observational study on 2998 patients. J Matern Fetal Neonatal Med 29(8):1339, 2016 [PubMed: 26037723]

Belfort M, Kofford S, Varner M: Massive obstetric hemorrhage in a Jehovah's Witness: intraoperative strategies and high-dose erythropoietin use. Am J Perinatol 28(3):207, 2011 [PubMed: 20827658]

Berhan Y, Berhan A: A meta-analysis of reverse breech extraction to deliver a deeply impacted head during cesarean delivery. Int J Gynaecol Obstet 124(2):99, 2014 [PubMed: 24290068]

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CHAPTER 30: Cesarean Delivery and Peripartum Hysterectomy,
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Bloom SL, for the National Institute of Child Health and Human Development Maternal–Fetal Medicine Units Cesarean Registry: Decision to incision times and infant outcome. Am J Obstet Gynecol 185:S121, 2001

Bloom SL, Leveno KJ, Spong CY, et al: Decision-to-incision times and maternal and fetal outcomes. Obstet Gynecol 108(1):6, 2006 [PubMed: 16816049]

Bodelon C, Bernabe-Ortiz A, Schiff MA, et al: Factors associated with peripartum hysterectomy. Obstet Gynecol 114(1):115, 2009 [PubMed: 19546767]

Bohman VR, Gilstrap L, Leveno K, et al: Subcutaneous tissue: to close or not to close at cesarean section. Am J Obstet Gynecol 166:407, 1992

Bolze PA, Massoud M, Gaucherand P, et al: What about the Misgav-Ladach surgical technique in patients with previous cesarean sections? Am J Perinatol 30(3):197, 2013 [PubMed: 22875660]

Boyle A, Reddy UM, Landy HJ, et al: Primary cesarean delivery in the United States. Obstet Gynecol 122(1):33, 2013 [PubMed: 23743454]

Boyle JG, Gabbe SG: T and J vertical extensions in low transverse cesarean births. Obstet Gynecol 87(2):238, 1996 [PubMed: 8559531]

Bragg D, El-Sharkawy AM, Psaltis E, et al: Postoperative ileus: recent developments in pathophysiology and management. Clin Nutr 34(3):367, 2015 [PubMed: 25819420]

Briery CM, Rose CH, Hudson WT, et al: Planned vs emergent cesarean hysterectomy. Am J Obstet Gynecol 197(2):154.e1, 2007

Buie VC, Owings MF, DeFrances CJ, et al: National Hospital Discharge Survey: 2006 summary. National Center for Health Statistics. Vital Health Stat 13(168):1, 2010

CAESAR Study Collaborative Group: Caesarean section surgical techniques: a randomised factorial trial (CAESAR). BJOG 117(11):1366, 2010 [PubMed: 20840692]

Cahill AG, Stamilio DM, Odibo AO, et al: Is vaginal birth after cesarean (VBAC) or elective repeat cesarean safer in women with a prior vaginal delivery? Am J Obstet Gynecol 195(4):1143, 2006 [PubMed: 16846571]

Caissutti C, Saccone G, Zullo F, et al: Vaginal cleansing before cesarean delivery: a systematic review and meta-analysis Obstet Gynecol 130(3):527, 2017 [PubMed: 28796683]

Carpenter L, Baysinger CL: Maintaining perioperative normothermia in the patient undergoing cesarean delivery. Obstet Gynecol Surv 67(7):436, 2012 [PubMed: 22926250]

Chai AH, Wong T, Mak HL, et al: Prevalence and associated risk factors of retention of urine after caesarean section. Int Urogynecol J Pelvic Floor Dysfunct 194(4):537, 2008

Chang SR, Chen KH, Ho HN, et al: Depressive symptoms, pain, and sexual dysfunction over the first year following vaginal or cesarean delivery: a prospective longitudinal study. Int J Nurs Stud 52(9):1433, 2015 [PubMed: 26008134]

Chapman SJ, Owen J, Hauth JC: One versus two-layer closure of a low transverse cesarean: the next pregnancy. Obstet Gynecol 89:16, 1997 [PubMed: 8990429]

Chaudhuri P, Mandi S, Mazumdar A: Rectally administrated misoprostol as an alternative to intravenous oxytocin infusion for preventing post-partum hemorrhage after cesarean delivery. J Obstet Gynaecol Res 40(9):2023, 2014 [PubMed: 25181622]

Cheesman K, Brady JE, Flood P, et al: Epidemiology of anesthesia-related complications in labor and delivery, New York State, 2002–2005. Anesth Analg 109:1174, 2009 [PubMed: 19762746]

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Chelmow D, Rodriguez EJ, Sabatini MM: Suture closure of subcutaneous fat and wound disruption after cesarean delivery: a meta-analysis. Obstet Gynecol 103:974, 2004 [PubMed: 15121573]

Clark SL, Belfort MA, Dildy GA, et al: Maternal death in the 21st century: causes, prevention, and relationship to cesarean delivery. Am J Obstet Gynecol 199(1):36.e1, 2008

Clark SL, Miller DD, Belfort MA, et al: Neonatal and maternal outcomes associated with elective term delivery. Am J Obstet Gynecol 200(2):156.e1, 2009

Conde-Agudelo A, Nieto A, Rosas-Bermudez A, et al: Misoprostol to reduce intraoperative and postoperative hemorrhage during cesarean delivery: a systematic review and metaanalysis. Am J Obstet Gynecol 209(1):40.e1, 2013

CORONIS Collaborative Group, Abalos E, Addo V, et al: Caesarean section surgical techniques: 3 year follow-up of the CORONIS fractional, factorial, unmasked, randomised controlled trial. Lancet 388(10039):62, 2016 [PubMed: 27155903]

CORONIS Collaborative Group, Abalos E, Addo V, et al: Caesarean section surgical techniques (CORONIS): a fractional, factorial, unmasked, randomised controlled trial. Lancet 382(9888):234, 2013 [PubMed: 23721753]

Cromi A, Ghezzi F, Di Naro E, et al: Blunt expansion of the low transverse uterine incision at cesarean delivery: a randomized comparison of 2 techniques. Am J Obstet Gynecol 199(3):292.e1, 2008

Dahlke JD, Mendez-Figueroa H, Rouse DJ, et al: Evidence-based surgery for cesarean delivery: an updated systematic review. Am J Obstet Gynecol 209(4):294, 2013 [PubMed: 23467047]

Davis JD: Management of injuries to the urinary and gastrointestinal tract during cesarean section. Obstet Gynecol Clin North Am 26(3):469, 1999 [PubMed: 10472066]

Daykan Y, Sharon-Weiner M, Pasternak Y, et al: Skin closure at cesarean delivery, glue versus subcuticular sutures: a randomized controlled trial. Am J Obstet Gynecol 216(4):406.e1, 2017

Declercq E, Menacker F, MacDorman M: Rise in “no indicated risk” primary caesareans in the United States, 1991–2001: cross sectional analysis. BMJ 330(7482):71, 2005 [PubMed: 15556953]

Dodd JM, Anderson ER, Gates S, et al: Surgical techniques for uterine incision and uterine closure at the time of caesarean section. Cochrane Database Syst Rev 7:CD004732, 2014

Dolan LM, Hilton P: Obstetric risk factors and pelvic floor dysfunction 20 years after first delivery. Int Urogynecol J 21(5):535, 2010 [PubMed: 20052571]

Duggal N, Poddatoori V, Noroozkhani S, et al: Perioperative oxygen supplementation and surgical site infection after cesarean delivery: a randomized trial. Obstet Gynecol 122(1):79, 2013 [PubMed: 23743467]

Durnwald C, Mercer B: Uterine rupture, perioperative and perinatal morbidity after single-layer and double-layer closure at cesarean delivery. Am J Obstet Gynecol 189:925, 2003 [PubMed: 14586327]

Edwards RK, Ingersoll M, Gerkin RD, et al: Carboxymethylcellulose adhesion barrier placement at primary cesarean delivery and outcomes at repeat cesarean delivery. Obstet Gynecol 123(5):923, 2014 [PubMed: 24785841]

Eisenkop SM, Richman R, Platt LD, et al: Urinary tract injury during cesarean section. Obstet Gynecol 60(5):591, 1982 [PubMed: 7145252]

Eke AC, Shukr GH, Chaalan TT, et al: Intra-abdominal saline irrigation at cesarean section: a systematic review and meta-analysis. J Matern Fetal

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CHAPTER 30: Cesarean Delivery and Peripartum Hysterectomy,
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Neonatal Med 29(10):1588, 2016 [PubMed: 26291302]

Fehniger JE, Brown JS, Creasman JM, et al: Childbirth and female sexual function later in life. Obstet Gynecol 122(5):988, 2013 [PubMed: 24104776]

Figueroa D, Jauk VC, Szychowski JM, et al: Surgical staples compared with subcuticular suture for skin closure after cesarean delivery: a randomized controlled trial. Obstet Gynecol 121(1):33, 2013 [PubMed: 23262925]

Flood KM, Said S, Geary M, et al: Changing trends in peripartum hysterectomy over the last 4 decades. Am J Obstet Gynecol 200(6):632.e1, 2009

Fritel X, Ringa V, Varnoux N, et al: Mode of delivery and fecal incontinence at midlife: a study of 2,640 women in the Gazel cohort. Obstet Gynecol 110(1):31, 2007 [PubMed: 17601893]

Glaze S, Ekwalanga P, Roberts G, et al: Peripartum hysterectomy: 1999 to 2006. Obstet Gynecol 111(3):732, 2008 [PubMed: 18310378]

Glazener C, Elders A, Macarthur C, et al: Childbirth and prolapse: long-term associations with the symptoms and objective measurement of pelvic organ prolapse. BJOG 120(2):161, 2013 [PubMed: 23190018]

Gordon A, McKechnie EJ, Jeffery H: Pediatric presence at cesarean section: justified or not? Am J Obstet Gynecol 193(3 pt 1):599, 2005 [PubMed: 16150248]

Gossman GL, Joesch JM, Tanfer K: Trends in maternal request cesarean delivery from 1991 to 2004. Obstet Gynecol 108: 1506, 2006 [PubMed: 17138787]

Govindappagari S, Wright JD, Ananth CV, et al: Risk of peripartum hysterectomy and center hysterectomy and delivery volume. Obstet Gynecol 128(6):1215, 2016 [PubMed: 27824750]

Grundsell HS, Rizk DE, Kumar RM: Randomized study of non-closure of peritoneum in lower segment cesarean section. Acta Obstet Gynecol Scand 77:110, 1998 [PubMed: 9492730]

Grupper M, Kuti JL, Swank ML, et al: Population pharmacokinetics of cefazolin in serum and adipose tissue from overweight and obese women undergoing cesarean delivery. J Clin Pharmacol 57(6):712, 2017 [PubMed: 27925657]

Guise JM, Denman MA, Emeis C, et al: Vaginal birth after cesarean: new insights on maternal and neonatal outcomes. Obstet Gynecol 115(6):1267, 2010 [PubMed: 20502300]

Güngördük K, Asıcıoğlu O, Celikkol O, et al: Iatrogenic bladder injuries during caesarean delivery: a case control study. J Obstet Gynaecol 30(7):667, 2010 [PubMed: 20925606]

Guo J, Long S, Li H, et al: Early versus delayed oral feeding for patients after cesarean. Int J Gynaecol Obstet 128(2):100, 2015 [PubMed: 25457588]

Gyhagen M, Bullarbo M, Nielsen TF, et al: Prevalence and risk factors for pelvic organ prolapse 20 years after childbirth: a national cohort study in singleton primiparae after vaginal or caesarean delivery. BJOG 120(2):152, 2013a

Gyhagen M, Bullarbo M, Nielsen TF, et al: The prevalence of urinary incontinence 20 years after childbirth: a national cohort study in singleton primiparae after vaginal or caesarean delivery. BJOG 120(2):144, 2013b

Haas DM, Morgan S, Contreras K: Vaginal preparation with antiseptic solution before cesarean section for preventing postoperative infections. Cochrane Database Syst Rev 12:CD007892, 2014

Haas DM, Pazouki F, Smith RR, et al: Vaginal cleansing before cesarean delivery to reduce postoperative infectious morbidity: a randomized, controlled trial. Am J Obstet Gynecol 202(3):310.e1, 2010

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CHAPTER 30: Cesarean Delivery and Peripartum Hysterectomy,
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Hadiati DR, Hakimi M, Nurdiati DS, et al: Skin preparation for preventing infection following caesarean section. Cochrane Database Syst Rev 9:CD007462, 2014

Hamilton BE, Martin JA, Osterman MJ, et al: Births: final data for 2014. Natl Vital Stat Rep 64(12):1, 2015

Handa VL, Blomquist JL, Knoepp LR, et al: Pelvic floor disorders 5–10 years after vaginal or cesarean childbirth. Obstet Gynecol 118(4):777, 2011 [PubMed: 21897313]

Hawkins JL, Chang J, Palmer SK, et al: Anesthesia-related maternal mortality in the United States: 1979–2002. Obstet Gynecol 117(1):69, 2011 [PubMed: 21173646]

Hellums EK, Lin MG, Ramsey PS: Prophylactic subcutaneous drainage for prevention of wound complications after cesarean delivery—a metaanalysis. Am J Obstet Gynecol 197(3):229, 2007 [PubMed: 17826401]

Hernandez JS, Nuangchamnong N, Ziadie M, et al: Placental and uterine pathology in women undergoing peripartum hysterectomy. Obstet Gynecol 119(6):1137, 2012 [PubMed: 22617577]

Hinkson L, Siedentopf JP, Weichert A, et al: Surgical site infection in cesarean sections with the use of a plastic sheath wound retractor compared to the traditional self-retaining metal retractor. Eur J Obstet Gynecol Reprod Biol 203:232, 2016 [PubMed: 27352285]

Hofmeyr JG, Novikova N, Mathai M, et al: Techniques for cesarean section. Am J Obstet Gynecol 201(5):431, 2009 [PubMed: 19879392]

Holmgren G, Sjöholm L, Stark M: The Misgav Ladach method for cesarean section: method description. Acta Obstet Gynecol Scand 78(7):615, 1999 [PubMed: 10422908]

Hubbard R, Waters JH, Yazer MH: Heterogeneity in blood product acceptance among antenatal patients of the Jehovah's Witness faith. Obstet Gynecol 126(5):974, 2015 [PubMed: 26444113]

Husarova V, Donnelly G, Doolan A, et al: Preferences of Jehovah's Witnesses regarding haematological supports in an obstetric setting: experience of a single university teaching hospital. Int J Obstet Anesth 25:53, 2016 [PubMed: 26597403]

Hussamy DJ, Wortman AC, McIntire DD, et al: Closed incision negative pressure therapy (ciNPT) and post-operative wound morbidity in morbidly obese women undergoing cesarean delivery. Presented at the 38th Annual Meeting of the Society for Maternal-Fetal Medicine, February 2018

Irion O, Luzuy F, Beguin F: Nonclosure of the visceral and parietal peritoneum at caesarean section: a randomised controlled trial. Br J Obstet Gynaecol 103:690, 1996 [PubMed: 8688397]

Jacob J, Phenninger J: Cesarean deliveries: When is a pediatrician necessary? Obstet Gynecol 89:217, 1997 [PubMed: 9015023]

James AH, Jamison MG, Brancazio LR, et al: Venous thromboembolism during pregnancy and the postpartum period: incidence, risk factors, and mortality. Am J Obstet Gynecol 194:1311, 2006 [PubMed: 16647915]

Jeve YB, Navti OB, Konje JC: Comparison of techniques used to deliver a deeply impacted fetal head at full dilation: a systematic review and meta-analysis. BJOG 123(3):337, 2016 [PubMed: 26301522]

Jin B, Du Y, Zhang F, et al: Carbetocin for the prevention of postpartum hemorrhage: a systematic review and meta-analysis of randomized controlled trials. J Matern Fetal Neonatal Med 29(3):400, 2016 [PubMed: 25579116]

Johnson DD: Cesarean delivery. In Yeomans ER, Hoffman BL, Gilstrap LC III, et al (eds): Cunningham and Gilstrap's Operative Obstetrics, 3rd ed. New York, McGraw-Hill Education, 2017

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Kammen BF, Levine MS, Rubesin SE, et al: Adynamic ileus after caesarean section mimicking intestinal obstruction: findings on abdominal radiographs. Br J Radiol 73(873):951, 2000 [PubMed: 11064647]

Kandadai P, Kandadai V, Saini J, et al: Acute urinary retention after cesarean delivery: a case-control study. Female Pelvic Med Reconstr Surg 20(5):276, 2014 [PubMed: 25181378]

Kapustian V, Anteby EY, Gdalevich M, et al: Effect of closure versus nonclosure of peritoneum at cesarean section on adhesions: a prospective randomized study. Am J Obstet Gynecol 206(1):56.e1, 2012

Katz DS, Baker ME, Rosen MP, et al: ACR Appropriateness Criteria® suspected small-bowel obstruction. American College of Radiology, 1996, Reaffirmed 2013

Kerr JM: The lower uterine segment incision in conservative caesarean section. J Obstet Gynaecol Br Emp 28:475, 1921

Kiefer DG, Muscat JC, Santorelli J, et al: Effectiveness and short-term safety of modified sodium hyaluronic acid-carboxymethylcellulose at cesarean delivery: a randomized trial. Am J Obstet Gynecol 214(3):373.e1, 2016

Kirscht J, Weiss C, Nickol J, et al: Dilatation or no dilatation of the cervix during cesarean section (Dondi Trial): a randomized controlled trial. Arch Gynecol Obstet 295(1):39, 2017 [PubMed: 27581586]

Klingel ML, Patel SV: A meta-analysis of the effect of inspired oxygen concentration on the incidence of surgical site infection following cesarean section. Int J Obstet Anesth 22(2):104, 2013 [PubMed: 23490472]

Kowalski TJ, Kothari SN, Mathiason MA, et al: Impact of hair removal on surgical site infection rates: a prospective randomized noninferiority trial. J Am Coll Surg 223(5):704, 2016 [PubMed: 27687471]

Krönig B: Transperitonealer cervikaler Kaiserschnitt. In: Doderlein A, Krönig B (eds): Operative Gynäkologie, 3rd ed. Leipzig, Thieme, 1912

Kurz A, Sessler DI, Lenhardt R: Perioperative normothermia to reduce the incidence of surgical-wound infection and shorten hospitalization. Study of Wound Infection and Temperature Group. N Engl J Med 334(19):1209, 1996 [PubMed: 8606715]

Larsson C, Saltvedt S, Wiklund I, et al: Planned vaginal delivery versus planned caesarean section: short-term medical outcome analyzed according to intended mode of delivery. J Obstet Gynaecol Can 33(8):796, 2011 [PubMed: 21846434]

Lawson T, Ralph C: Perioperative Jehovah's Witnesses: a review. Br J Anaesth 115(5):676, 2015 [PubMed: 26068896]

Lefebvre A, Saliou P, Lucet JC, et al: Preoperative hair removal and surgical site infections: network meta-analysis of randomized controlled trials. J Hosp Infect 91(2):100, 2015 [PubMed: 26320612]

Leijonhufvud A, Lundholm C, Cnattingius S, et al: Risks of stress urinary incontinence and pelvic organ prolapse surgery in relation to mode of childbirth. Am J Obstet Gynecol 204(1):70.e1, 2011

Li L, Wen J, Wang L, et al: Is routine indwelling catheterisation of the bladder for caesarean section necessary? A systematic review. BJOG 118(4):400, 2011 [PubMed: 21176084]

Liabsuetrakul T, Peeyananjarassri K: Mechanical dilatation of the cervix at non-labour caesarean section for reducing postoperative morbidity. Cochrane Database Syst Rev 11:CD008019, 2011

Liang CC, Chang SD, Chang YL, et al: Postpartum urinary retention after cesarean delivery. Int J Gynaecol Obstet 99(3):229, 2007 [PubMed: 17640646]

Linder N, Linder I, Fridman E, et al: Birth trauma—risk factors and short-term neonatal outcome. J Matern Fetal Neonatal Med 26(15):1491, 2013

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CHAPTER 30: Cesarean Delivery and Peripartum Hysterectomy,
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[PubMed: 23560503]

Liu X, Landon MB, Cheng W, et al: Cesarean delivery on maternal request in China: what are the risks and benefits? Am J Obstet Gynecol 212(6):817.e1, 2015

Ljungqvist O, Scott M, Fearon KC: Enhanced recovery after surgery: a review. JAMA Surg 152(3):292, 2017 [PubMed: 28097305]

Lurie S, Baider C, Glickman H, et al: Are enemas given before cesarean section useful? A prospective randomized controlled study. Eur J Obstet Gynecol Reprod Biol 163(1):27, 2012 [PubMed: 22516178]

MacArthur C, Glazener C, Lancashire R, et al: Exclusive caesarean section delivery and subsequent urinary and faecal incontinence: a 12-year longitudinal study. BJOG 118(8):1001, 2011 [PubMed: 21477171]

MacArthur C, Wilson D, Herbison P, et al: Faecal incontinence persisting after childbirth: a 12 year longitudinal study. BJOG 120(2):169, 2013 [PubMed: 23190303]

Mackeen AD, Khalifeh A, Fleisher J, et al: Suture compared with staple skin closure after cesarean delivery: a randomized controlled trial Obstet Gynecol 123(6):1169, 2014a

Mackeen AD, Packard RE, Ota E, et al: Timing of intravenous prophylactic antibiotics for preventing postpartum infectious morbidity in women undergoing cesarean delivery. Cochrane Database Syst Rev 12:CD009516, 2014b

Mackeen AD, Schuster M, Berghella V: Suture versus staples for skin closure after cesarean: a metaanalysis. Am J Obstet Gynecol 212(5):621.e1, 2015

Maggio L, Nicolau DP, DaCosta M, et al: Cefazolin prophylaxis in obese women undergoing cesarean delivery: a randomized controlled trial. Obstet Gynecol 125(5):1205, 2015 [PubMed: 25932849]

Maglinte DD, Balthazar EJ, Kelvin FM, et al: The role of radiology in the diagnosis of small bowel obstruction. AJR Am J Roentgenol 168(5):1171, 1997 [PubMed: 9129407]

Marshall NE, Fu R, Guise JM: Impact of multiple cesarean deliveries on maternal morbidity: a systematic review. Am J Obstet Gynecol 205(3):262.e1, 2011

Martin JA, Hamilton BE, Osterman MJ, et al: Births: final data for 2015. Natl Vital Stat Rep 66(1):1, 2017 [PubMed: 28135188]

Mason CL, Tran CK: Caring for the Jehovah's Witness parturient. Anesth Analg 121(6):1564, 2015 [PubMed: 26579658]

Mathai M, Hofmeyr GJ, Mathai NE: Abdominal surgical incisions for caesarean section. Cochrane Database Syst Rev 5:CD004453, 2013

McDonald EA, Brown SJ: Does method of birth make a difference to when women resume sex after childbirth? BJOG 120(7):823, 2013 [PubMed: 23442053]

Memon S, Qazi RA, Bibi S, et al: Effect of preoperative vaginal cleansing with an antiseptic solution to reduce post caesarean infectious morbidity. J Pak Med Assoc 61(12):1179, 2011 [PubMed: 22355962]

Menacker F, Declercq E, Macdorman MF: Cesarean delivery: background, trends, and epidemiology. Semin Perinatol 30(5):235, 2006 [PubMed: 17011392]

Menderes G, Athar Ali N, et al: Chlorhexidine-alcohol compared with povidone-iodine for surgical-site antisepsis in cesarean deliveries. Obstet Gynecol 120(5):1037, 2012 [PubMed: 23090520]

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CHAPTER 30: Cesarean Delivery and Peripartum Hysterectomy,
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Moczygemba CK, Paramsothy P, Meikle S, et al: Route of delivery and neonatal birth trauma. Am J Obstet Gynecol 202(4):361.e1, 2010

Moore ER, Bergman N, Anderson GC, et al: Early skin-to-skin contact for mothers and their healthy newborn infants. Cochrane Database Syst Rev 11:CD003519, 2016 [PubMed: 27885658]

Morales KJ, Gordon MC, Bates GW Jr: Postcesarean delivery adhesions associated with delayed delivery of infant. Am J Obstet Gynecol 196(5):461.e1, 2007

Nagele F, Karas H, Spitzer D, et al: Closure or nonclosure of the visceral peritoneum at cesarean delivery. Am J Obstet Gynecol 174:1366, 1996 [PubMed: 8623871]

Nasr AM, ElBigawy AF, Abdelamid AE, et al: Evaluation of the use vs nonuse of urinary catheterization during cesarean delivery: a prospective, multicenter, randomized controlled trial. J Perinatol 29(6):416, 2009 [PubMed: 19212327]

National Institutes of Health: State-of-the-Science Conference Statement on Cesarean Delivery on Maternal Request. NIH Consens Sci Statements, 2006. Mar 27–29, 23(1):1, 2006

Nelson RL, Furner SE, Westercamp M, et al: Cesarean delivery for the prevention of anal incontinence. Cochrane Database Syst Rev 2:CD006756, 2010

Ngai IM, Van Arsdale A, Govindappagari S, et al: Skin preparation for prevention of surgical site infection after cesarean delivery: a randomized controlled trial. Obstet Gynecol 126(6):1251, 2015 [PubMed: 26551196]

Nooh AM, Abdeldayem HM, Ben-Affan O et al: Reverse breech extraction versus the standard approach of pushing the impacted fetal head up through the vagina in caesarean section for obstructed labour: a randomised controlled trial. J Obstet Gynaecol 37(4):459, 2017 [PubMed: 28141942]

Oliphant SS, Bochenska K, Tolge ME, et al: Maternal lower urinary tract injury at the time of cesarean delivery. Int Urogynecol J 25(12):1709, 2014 [PubMed: 24964762]

Olofsson P: Opening of the abdomen ad modum Joel Cohen, Joel-Cohen, Joel Joel-Cohen, or just Cohen? Acta Obstet Gynecol Scand 94(2):224, 2015 [PubMed: 25489631]

O'Neill HA, Egan G, Walsh CA, et al: Omission of the bladder flap at caesarean section reduces delivery time without increased morbidity: a meta-analysis of randomised controlled trials. Eur J Obstet Gynecol Reprod Biol 174:20, 2014 [PubMed: 24411951]

Orbach A, Levy A, Wiznitzer A, et al: Peripartum cesarean hysterectomy: critical analysis of risk factors and trends over the years. J Matern Fetal Neonatal Med 24(3):480, 2011 [PubMed: 20636233]

Osmundson SS, Garabedian MJ, Lyell DJ: Risk factors for classical hysterotomy by gestational age. Obstet Gynecol 122:845, 2013 [PubMed: 24084543]

Osmundson SS, Garabedian MJ, Yeaton-Massey A, et al: Risk factors for classical hysterotomy in twin pregnancies. Obstet Gynecol 125(3):643, 2015 [PubMed: 25730228]

Owolabi MS, Blake RE, Mayor MT, et al: Incidence and determinants of peripartum hysterectomy in the metropolitan area of the District of Columbia. J Reprod Med 58(3–4):167, 2013 [PubMed: 23539887]

Patterson LS, O'Connell CM, Baskett TF: Maternal and perinatal morbidity associated with classic and inverted T cesarean incisions. Obstet Gynecol 100(4):633, 2002 [PubMed: 12383525]

Peleg D, Eberstark E, Warsof SL, et al: Early wound dressing removal after scheduled cesarean delivery: a randomized controlled trial. Am J Obstet Gynecol 215(3):388.e1, 2016

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CHAPTER 30: Cesarean Delivery and Peripartum Hysterectomy,
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Pereira Gomes Morais E, Riera R, Porfírio GJ, et al: Chewing gum for enhancing early recovery of bowel function after caesarean section. Cochrane Database Syst Rev 10:CD011562, 2016 [PubMed: 27747876]

Pergialiotis V, Prodromidou A, Perrea DN, et al: The impact of subcutaneous tissue suturing at cesarean section on wound complications: a meta-analysis. BJOG 124(7):1018, 2017 [PubMed: 28176441]

Phipps MG, Watabe B, Clemons JL, et al: Risk factors for bladder injury during cesarean delivery. Obstet Gynecol 105(1):156, 2005 [PubMed: 15625157]

Pritchard JA: Changes in the blood volume during pregnancy and delivery. Anesthesiology 26:393, 1965 [PubMed: 14313451]

Rahman MS, Gasem T, Al Suleiman SA, et al: Bladder injuries during cesarean section in a university hospital: a 25-year review. Arch Gynecol Obstet 279(3):349, 2009 [PubMed: 18648828]

Rajasekar D, Hall M: Urinary tract injuries during obstetric intervention. BJOG 104:731, 1997

Ramsey PS, White AM, Guinn DA, et al: Subcutaneous tissue reapproximation, alone or in combination with drain, in obese women undergoing cesarean delivery. Obstet Gynecol 105(5 Pt 1):967, 2005 [PubMed: 15863532]

Reddy UM, Wapner RJ, Rebar RW, et al: Infertility, assisted reproductive technology, and adverse pregnancy outcomes: executive summary of a National Institute of Child Health and Human Development workshop. Obstet Gynecol 109(4):967, 2007 [PubMed: 17400861]

Roach MK, Abramovici A, Tita AT: Dose and duration of oxytocin to prevent postpartum hemorrhage: a review. Am J Perinatol 30(7):523, 2013 [PubMed: 23208766]

Roberge S, Chaillet N, Boutin A, et al: Single- versus double-layer closure of the hysterotomy incision during cesarean delivery and risk of uterine rupture. Int J Gynaecol Obstet 115(1):5, 2011 [PubMed: 21794864]

Roberge S, Demers S, Berghella V, et al: Impact of single- vs double-layer closure on adverse outcomes and uterine scar defect: a systematic review and metaanalysis. Am J Obstet Gynecol 211(5):453, 2014 [PubMed: 24912096]

Rogers RG, Leeman LM, Borders N, et al: Contribution of the second stage of labour to pelvic floor dysfunction: a prospective cohort comparison of nulliparous women. BJOG 121(9):1145, 2014 [PubMed: 24548705]

Rossi AC, Lee RH, Chmait RH: Emergency postpartum hysterectomy for uncontrolled postpartum bleeding: a systematic review. Obstet Gynecol 115(3):637, 2010 [PubMed: 20177297]

Rossouw JN, Hall D, Harvey J: Time between skin incision and delivery during cesarean. Int J Gynaecol Obstet 121(1):82, 2013 [PubMed: 23340272]

Royal College of Obstetricians and Gynaecologists: Reducing the risk of venous thromboembolism during pregnancy and the puerperium. Green-Top Guideline No. 37a, April 2015

Saad AF, Rahman M, Costantine MM, et al: Blunt versus sharp uterine incision expansion during low transverse cesarean delivery: a metaanalysis. Am J Obstet Gynecol 211(6):684.e1, 2014

Safa H, Beckmann M: Comparison of maternal and neonatal outcomes from full-dilatation cesarean deliveries using the Fetal Pillow or hand-push method. Int J Gynaecol Obstet 135(3):281, 2016 [PubMed: 27599604]

Scolari Childress KM, Gavard JA, et al: A barrier retractor to reduce surgical site infections and wound disruptions in obese patients undergoing cesarean delivery: a randomized controlled trial. Am J Obstet Gynecol 214(2):285.e1, 2016

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CHAPTER 30: Cesarean Delivery and Peripartum Hysterectomy,
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Seal SL, Dey A, Barman SC, et al: Randomized controlled trial of elevation of the fetal head with a fetal pillow during cesarean delivery at full cervical dilatation. Int J Gynaecol Obstet 133(2):178, 2016 [PubMed: 26868074]

Sharp HT, Adelman MR. Prevention, recognition, and management of urologic injuries during gynecologic surgery. Obstet Gynecol 127(6):1085, 2016 [PubMed: 27159741]

Shellhaas CS, Gilbert S, Landon MB, et al: The frequency and complication rates of hysterectomy accompanying cesarean delivery. Obstet Gynecol 114(2 Pt 1):224, 2009 [PubMed: 19622981]

Shree R, Park SY, Beigi RH, et al: Surgical site infection following cesarean delivery: patient, provider, and procedure-specific risk factors. Am J Perinatol 33(2):157, 2016 [PubMed: 26344010]

Siddiqui DS, Lacuna EM, Chen HY, et al: Skin closure of Pfannenstiel incision with Dermabond, staples, or suture during cesarean delivery: experience of a single attending. Am J Perinatol 30(3):219, 2013 [PubMed: 22875661]

Sikirica V, Broder MS, Chang E, et al: Clinical and economic impact of adhesiolysis during repeat cesarean delivery. Acta Obstet Gynecol Scand 91(6):719, 2012 [PubMed: 22404156]

Silver RM, Landon MB, Rouse DJ, et al: Maternal morbidity associated with multiple repeat cesarean deliveries. Obstet Gynecol 107:1226, 2006 [PubMed: 16738145]

Simonazzi G, Bisulli M, Saccone G, et al: Tranexamic acid for preventing postpartum blood loss after cesarean delivery: a systematic review and meta-analysis of randomized controlled trials. Acta Obstet Gynecol Scand 95(1):28, 2016 [PubMed: 26698831]

Smaill FM, Grivell RM: Antibiotic prophylaxis versus no prophylaxis for preventing infection after cesarean section. Cochrane Database Syst Rev 10:CD007482, 2014

Smid MC, Dotters-Katz SK, Grace M, et al: prophylactic negative pressure wound therapy for obese women after cesarean delivery: a systematic review and meta-analysis. Obstet Gynecol 130(5):969, 2017 [PubMed: 29016508]

Smid MC, Smiley SG, Schulkin J, et al: The problem of the pannus: physician preference survey and a review of the literature on cesarean skin incision in morbidly obese women. Am J Perinatol 33(5):463, 2016 [PubMed: 26510932]

Society for Maternal-Fetal Medicine, Belfort MA: Placenta accreta. Am J Obstet Gynecol 203(5):430, 2010 [PubMed: 21055510]

Springel EH, Wang XY, Sarfoh VM, et al: A randomized open-label controlled trial of chlorhexidine-alcohol vs povidone-iodine for cesarean antisepsis: the CAPICA trial. Am J Obstet Gynecol 217(4):463.el, 2017

Stevens J, Schmied V, Burns E, et al: Immediate or early skin-to-skin contact after a Caesarean section: a review of the literature. Matern Child Nutr 10(4):456, 2014 [PubMed: 24720501]

Sullivan SA, Smith T, Chang E, et al: Administration of cefazolin prior to skin incision is superior to cefazolin at cord clamping in preventing postcesarean infectious morbidity: a randomized controlled trial. Am J Obstet Gynecol 196:455, 2007 [PubMed: 17466699]

Swank ML, Wing DA, Nicolau DP, et al: Increased 3-gram cefazolin dosing for cesarean delivery prophylaxis in obese women. Am J Obstet Gynecol 213(3):415.e1, 2015

Tan PG, Norazilah MJ, Omar SZ: Hospital discharge on the first compared with the second day after a planned cesarean delivery: a randomized controlled trial. Obstet Gynecol 120(6):1273, 2012 [PubMed: 23168750]

Tanner J, Norrie P, Melen K: Preoperative hair removal to reduce surgical site infection. Cochrane Database Syst Rev 11:CD004122, 2011

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CHAPTER 30: Cesarean Delivery and Peripartum Hysterectomy,
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Tarney CM: Bladder injury during cesarean delivery. Curr Womens Health Rev 9(2):70, 2013 [PubMed: 24876830]

The Joint Commission: Facts about the universal protocol. 2013. Available at: http://www.jointcommission.org/standards_information/up.aspx. Accessed May 12, 2013

The Joint Commission: Surgical care improvement project core measure set. 2016. Available at: http://www.jointcommission.org/assets/1/6/Surgical%20Care%20Improvement%20Project.pdf. Accessed February 14, 2017

Theodoridis TD, Chatzigeorgiou KN, Zepiridis L, et al: A prospective randomized study for evaluation of wound retractors in the prevention of incision site infections after cesarean section. Clin Exp Obstet Gynecol 38(1):57, 2011 [PubMed: 21485728]

Tita AT, Hauth JC, Grimes A, et al: Decreasing incidence of postcesarean endometritis with extended-spectrum antibiotic prophylaxis. Obstet Gynecol 111(1):51, 2008 [PubMed: 18165392]

Tita AT, Landon MB, Spong CY, et al: Timing of elective repeat cesarean delivery at term and neonatal outcomes. N Engl J Med 360(2):111, 2009 [PubMed: 19129525]

Tita AT, Szychowski JM, Boggess K, et al: Adjunctive azithromycin prophylaxis for cesarean delivery. N Engl J Med 375(13):1231, 2016 [PubMed: 27682034]

Tolcher MC, Johnson RL, El-Nashar SA, et al: Decision-to-incision time and neonatal outcomes: a systematic review and meta-analysis. Obstet Gynecol 123(3):536, 2014 [PubMed: 24499762]

Tulandi T, Agdi M, Zarei A, Miner L, et al: Adhesion development and morbidity after repeat cesarean delivery. Am J Obstet Gynecol 201(1):56.e1, 2009

Tuuli MG, Liu J, Stout MJ, et al: A randomized trial comparing skin antiseptic agents at cesarean delivery. N Engl J Med 374(7):647, 2016a

Tuuli MG, Odibo AO, Fogertey P, et al: Utility of the bladder flap at cesarean delivery: a randomized controlled trial. Obstet Gynecol 119(4):815, 2012 [PubMed: 22395144]

Tuuli MG, Stout MJ, Martin S, et al: Comparison of suture materials for subcuticular skin closure at cesarean delivery. Am J Obstet Gynecol 215(4):490.e1, 2016b

Villar J, Carroli G, Zavaleta N, et al: Maternal and neonatal individual risks and benefits associated with caesarean delivery: multicentre prospective study. BJM 335:1025, 2007

Viney R, Isaacs C, Chelmow D: Intra-abdominal irrigation at cesarean delivery: a randomized controlled trial. Obstet Gynecol 119(6):1106, 2012 [PubMed: 22617574]

Walsh CA, Walsh SR: Extraabdominal vs intraabdominal uterine repair at cesarean delivery: a metaanalysis. Am J Obstet Gynecol 200(6):625.e1, 2009

Wang HY, Hong SK, Duan Y, et al: Tranexamic acid and blood loss during and after cesarean section: a meta-analysis. J Perinatol 35(10):818, 2015 [PubMed: 26226243]

Witt A, Döner M, Petricevic L, et al: Antibiotic prophylaxis before surgery vs after cord clamping in elective cesarean delivery: a double-blind, prospective, randomized, placebo-controlled trial. Arch Surg 146(12):1404, 2011 [PubMed: 22184305]

Worley KC, McIntire DD, Leveno KJ: The prognosis for spontaneous labor in women with uncomplicated term pregnancies: implications for cesarean delivery on maternal request. Obstet Gynecol 113(4):812, 2009 [PubMed: 19305324]

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Wrench IJ, Allison A, Galimberti A, et al: Introduction of enhanced recovery for elective caesarean section enabling next day discharge: a tertiary centre experience. Int J Obstet Anesth 24(2):124, 2015 [PubMed: 25794417]

Wyckoff MH, Aziz K, Escobedo MB, et al: Part 13: Neonatal resuscitation: 2015 American Heart Association guidelines update for cardiopulmonary resuscitation and emergency cardiovascular care. Circulation 132(18 Suppl 2):S543, 2015 [PubMed: 26473001]

Wylie BJ, Gilbert S, Landon MB, et al: Comparison of transverse and vertical skin incision for emergency cesarean delivery. Obstet Gynecol 115(6):1134, 2010 [PubMed: 20502282]

Xodo S, Saccone G, Cromi A, et al: Cephalad-caudad versus transverse blunt expansion of the low transverse uterine incision during cesarean delivery. Eur J Obstet Gynecol Reprod Biol 202:75, 2016 [PubMed: 27180273]

Yildirim G, Güngördük K, Asıcıoğlu O, et al: Does vaginal preparation with povidone-iodine prior to caesarean delivery reduce the risk of endometritis? A randomized controlled trial. J Matern Fetal Neonatal Med 25(11):2316, 2012 [PubMed: 22590998]

Yossepowitch O, Baniel J, Livne PM: Urological injuries during cesarean section: intraoperative diagnosis and management. J Urol 172(1):196, 2004 [PubMed: 15201771]

Yost NP, Bloom SL, Sibley MK, et al: A hospital-sponsored quality improvement study of pain management after cesarean delivery. Am J Obstet Gynecol 190:1341, 2004 [PubMed: 15167840]

Young OM, Shaik IH, Twedt R, et al: Pharmacokinetics of cefazolin prophylaxis in obese gravidae at time of cesarean delivery. Am J Obstet Gynecol 213(4):541.e1, 2015

Zaphiratos V, George RB, Boyd JC, et al: Uterine exteriorization compared with in situ repair for cesarean delivery: a systematic review and meta-analysis. Can J Anaesth 62(11):1209, 2015 [PubMed: 26296298]

Zhu YP, Wang WJ, Zhang SL, et al: Effects of gum chewing on postoperative bowel motility after caesarean section: a meta-analysis of randomised controlled trials. BJOG 121(7):787, 2014 [PubMed: 24629205]

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